Verso® Cologne Folding Bike

Model KC720-220 (Gloss Black)
Model KC720-550 (Gloss White)

Printed on 100% recycled paper

⚠ WARNING:
CHOKING HAZARD- - Small Parts
Not for children under 3 yrs.

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DO NOT RETURN TO STORE! Contact KETTLER Parts and Service for replacement parts, parts@KETTLERusa.com / 866-804-0440

Introduction

Read these instructions carefully before using your folding bike for the first time. They contain important information for your safety and for the correct use and maintenance of this KETTLER® product. Keep the instructions in a safe place.

This KETTLER® product has been designed in accordance with the latest standards of safety and subjected to constant quality monitoring. The data gained from this quality process is then incorporated in the development of our products. For this reason, we reserve the right to make changes in design and technology in order to offer our customers products of the highest standard of quality at all times. In spite of this, should you have any ground for complaint, please contact your KETTLER® dealer.

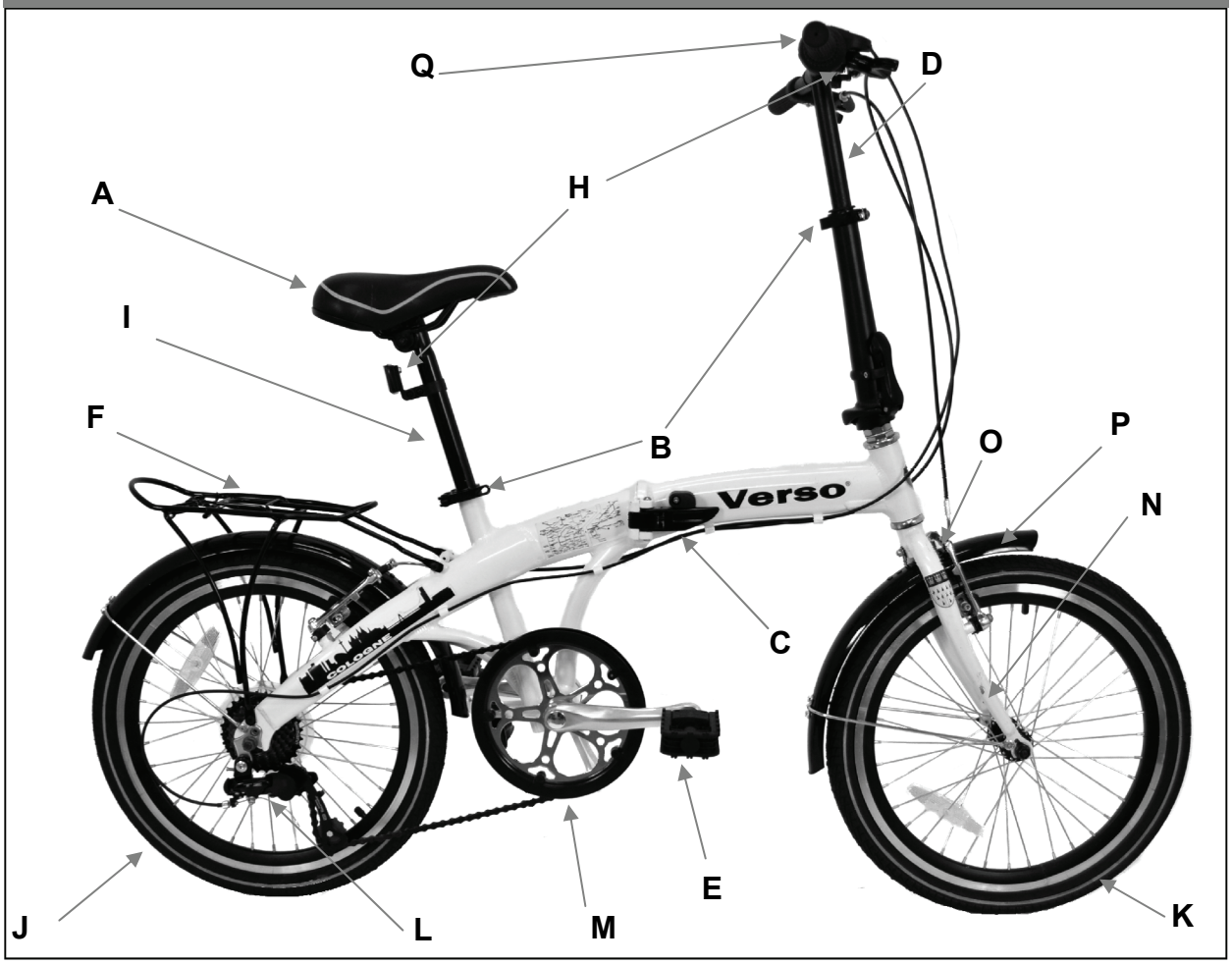
For Your Safety

For your safety and enjoyment it is important for you to practice the folding and unfolding of your bicycle several times before riding it for the first time. After carefully following these simple instructions you should be able to successfully fold, or unfold your new bike in a matter of seconds. Always follow the sequence provided in this instruction guide.

- Before you ride your new bike, we recommend that you have it checked out by a professional bike technician. This will ensure your safety and ensure maximum performance.
- Before each bike ride we suggest that you examine your bike, adjust and tighten all fittings and quick connect locks, and check your brakes and tire pressure.
- If your bike has been damaged or any of the quick lock features are not working properly, do not ride your bike. Have it serviced by a qualified technician.
- Before you ride your bike you should know all of the safety regulations in your area. Please observe all safety regulations and rules of the road.
- Maximum rider weight should not exceed 240 lbs.
- Always wear a safety helmet when riding this bicycle.
- Luggage rack is not meant to be ridden on.

Additional safety information is available in the KETTLER® Bike Manual supplied separately from this bicycle. Contact our Parts Department to obtain a comprehensive KETTLER® Bike Manual. NOTE— This manual is only meant to act as a guide. KETTLER recommends that your bike be regularly serviced by a qualified bike mechanic

Parts Checklist



A. Saddle

B. Quick Release Levers

C. Double-Lock Quick Release Frame Lock

D. Handlebar Assembly (includes: headset, adjustable handlebars, handlebar stem, grips, shifter and brake levers)

E. Folding Pedals

F. Luggage Rack

G. Carrying/Storage Bag

H. Reflectors (1 red/1 white)

I. Seat Post

J. Rear Wheel

K. Front Wheel

L. Rear Derailleur

M. Crank Set

N. Fork

O. Brake (front)

P. Fender (front)

Q. Bell

R. Hook & Loop Fastening Strap (not pictured)

G

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Stem Assembly

Assembling Stem/Handlebar Components

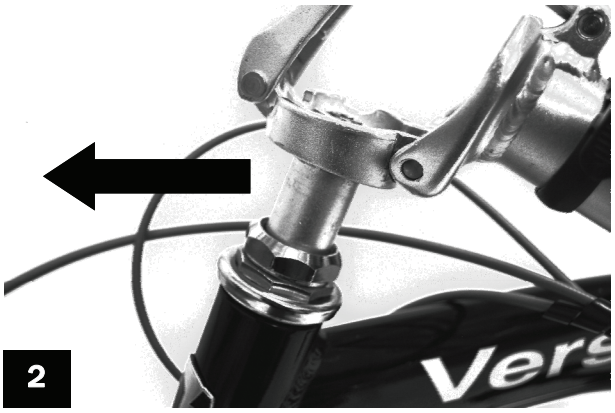
1. Insert the entire stem assembly as shown in fig. 1.

2. Set stem at desired height and align so handlebars are perpendicular to the frame, see fig. 2.

3. Once stem is at desired height and angle, tighten expander wedge & bolt using a #8 Hex key, see fig. 3.

Note — Always ensure the stem connection is properly and tightly secured before riding. Check locking lever and ensure it is properly secured before riding. Adjust for proper tightness when necessary.

1


2

3

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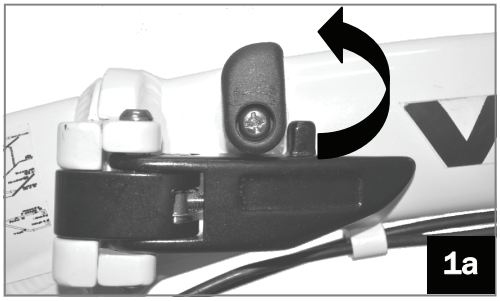
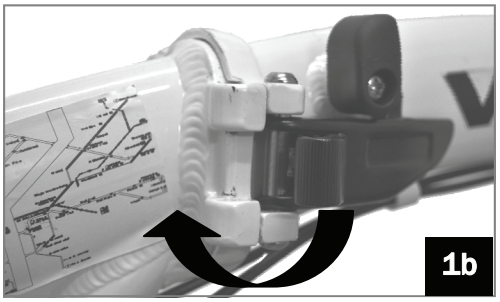
Unfolding For Riding

As Easy as 1—2—3!

1. Unfold and lock the frame

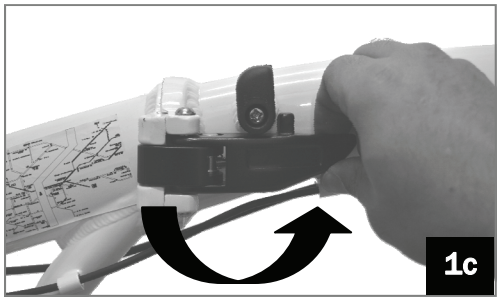


First position the secondary safety lock is in the upright position (1a). Standing on the chain side of the bike, bring the front and rear halves of the bike together into the closed position.

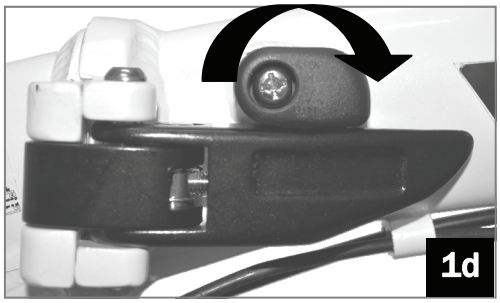


Then, pull back the frame locking lever so the clasp engages the rear half frame (1b). With the clasp engaged, pivot the frame locking lever forward until it "snaps" shut. (1c)

With the frame locking lever in the closed position, bring down the secondary safety lock to secure the frame locking lever (1d).



Note — Always ensure the frame connection is properly and tightly secured before riding.
Check Frame Locking Lever regularly and if loose, adjust as needed. To adjust frame locking lever, slowly turn the adjustment bolt in the frame locking lever using an Allen wrench in 1/16 increments. Failure to effectively adjust the lever could result in the Frame Locking Lever being too tight or too loose.



DO NOT RIDE IFLOCKING LEVER IS NOT SECURELY CLOSED AND LOCKED TIGHTLY!

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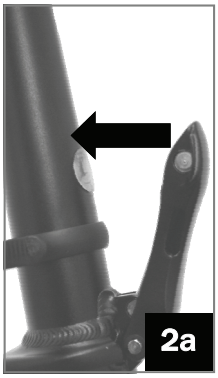
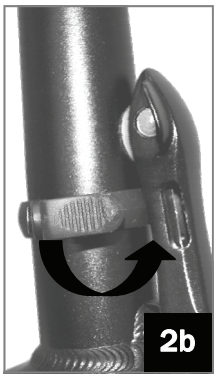
Unfolding For Riding

2. Fold and lock the handlebar assembly





Swing the handlebar assembly and stem locking lever into the up position (2a), then "snap" the locking lever closed (2b).

With the stem locking lever in the closed position, rotate the secondary safety lock counter clockwise to secure the stem locking lever (2c).

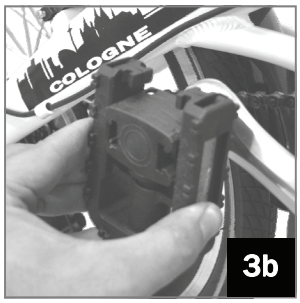
Note — Always ensure the stem connection is properly and tightly secured before riding.
Check locking lever and ensure it is properly secured before riding. Adjust for proper tightness when necessary. To adjust frame locking lever, slowly turn the adjustment bolt in the stem locking lever using a Phillips head screwdriver in 1/16 increments. Failure to effectively adjust the lever could result in the Stem Locking Lever being too tight or too loose.
If the stem locking lever does not "snap" closed, it is in need of adjustment.

3. Unfold and lock the pedals

The folded pedal is held in position by a spring loaded locking mechanism (3a).

Simply unfold the pedal and ensure it locks into its riding position (3b).

Release the pedal assembly making sure it locks into position to secure the pedal (3c). Repeat for other pedal. Adjust the seat assembly for comfortable rider position as described in this manual, never extending the seat post past the Minimum Insertion mark. Always ensure the seat clamp is securely tightened before riding.



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Folding For Storage

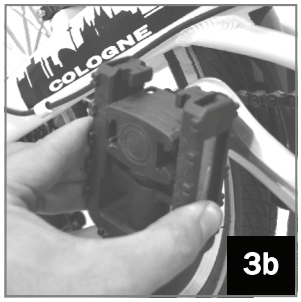
As Easy As 3—2—1!

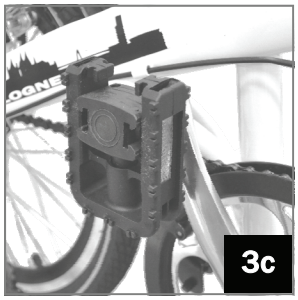
3. Unlock and fold the pedals

Using your thumb, compress and hold the spring loaded pedal assembly (3a).

Fold the pedal into its folded position (3b).

Release the pedal assembly making sure it locks into position to secure the pedal (3c). Repeat for other pedal.



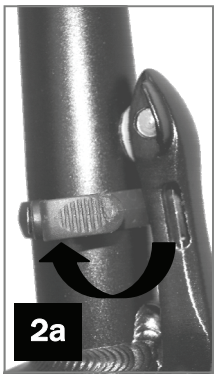


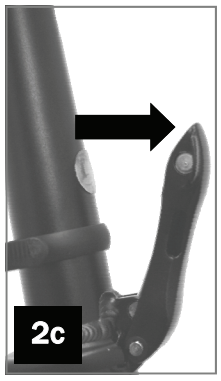
2. Unlock and fold the handlebar assembly

With the stem locking lever in the closed position, rotate the secondary safety lock to unsecure the stem locking lever (2a).

Pull stem locking lever away from the stem and fold down the handlebar assembly (2b-2c).

Note — Always ensure the stem connection is properly secured before riding.
Check and Adjust Stem Locking Lever regularly. To adjust frame locking lever, slowly turn the adjustment bolt in the stem locking lever using a Phillips head screwdriver in 1/16 increments. Failure to effectively adjust the lever could result in the Stem Locking Lever being too tight or too loose.





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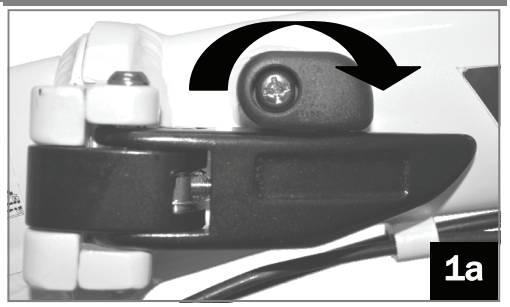
Folding For Storage

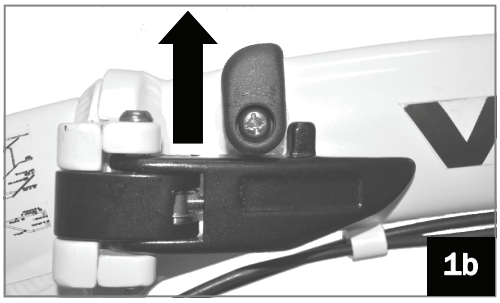
1. Unfold and lock the frame

With the frame locking lever in the closed position, bring up the secondary safety lock to unsecure the frame locking lever (1a).

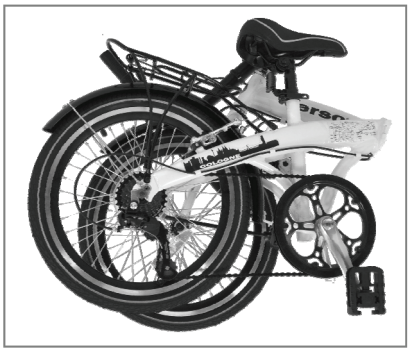


The secondary safety lock should now be in the upright position (1b).

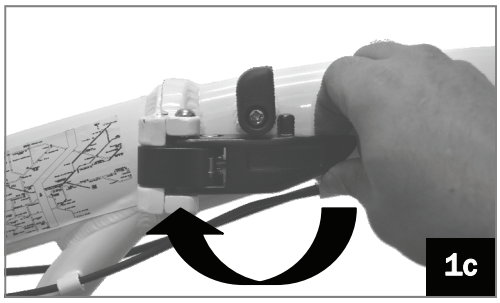
Then, pull back the frame locking lever so the clasp disengages the rear half frame (1c). With the clasp disengaged, swing the frame locking lever forward until it opens. (1d)



Then swing the front half of the bike away from the rear half of the bike.

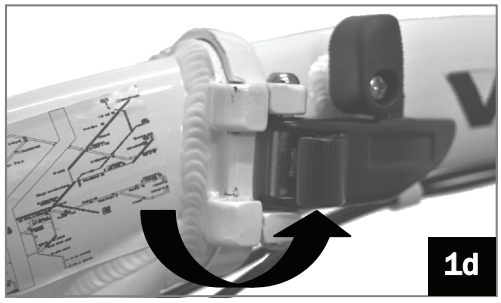


Note — To save additional space, you can lower the seat assembly all the way down to the frame or completely remove it from the frame. Pull up the quick release seat lever and flip over. Allow the seat assembly to slide all the way down to the frame or remove it completely.



Note — Always ensure the frame connection is properly secured before riding.

Check and Adjust Frame Locking Lever regularly. To adjust frame locking lever, slowly turn the adjustment bolt in the frame locking lever using an Allen wrench in 1/16 increments. Failure to effectively adjust the lever could result in the Frame Locking Lever being too tight or too loose.



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Basic Adjustments

Seatpost

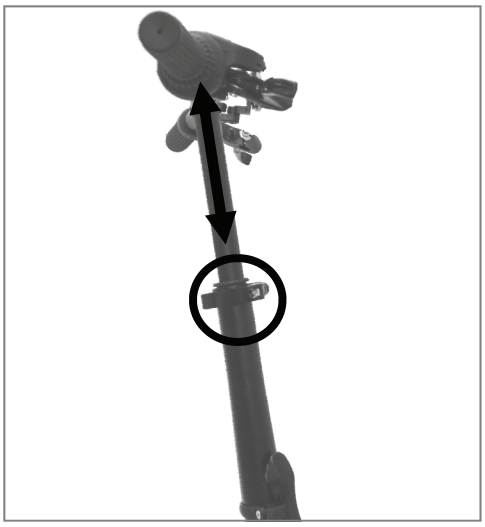
You can easily and quickly adjust the height of the seatpost to fit almost any rider

Locate the Quick Release seat lever. Lift the lever and flip open. Adjust the seatpost as desired. Flip the lever back over to tighten. Make sure lever is always completely tightened before riding.

Caution: If the Seat Assembly can still turn from side to side or slide up and down, tighten the tension adjusting nut on the other side of the Quick Release lever before securing.

DO NOT EXPAND THE SEAT POST PAST THE "MINIMUM INSERTION" LINE.

Stem



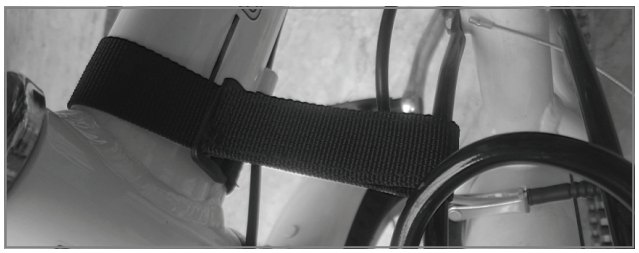
You can easily and quickly adjust the height of the stem to fit almost any rider

Locate the Quick Release seat lever. Lift the lever and flip open. Adjust the stem as desired. Flip the lever back over to tighten. Make sure lever is always completely tightened before riding.

Caution: If the stem can still slide up and down, tighten the tension adjusting nut on the other side of the Quick Release lever before securing.

Hook & Loop Fastening Strap

Your Cologne should come packaged with the two bike frame pieces held together by a Hook & Loop Fastening Strap , see below. You can use this strap when storing your Cologne and can easily be wrapped around the frame when using the bike.



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Basic Adjustments *cont'd*

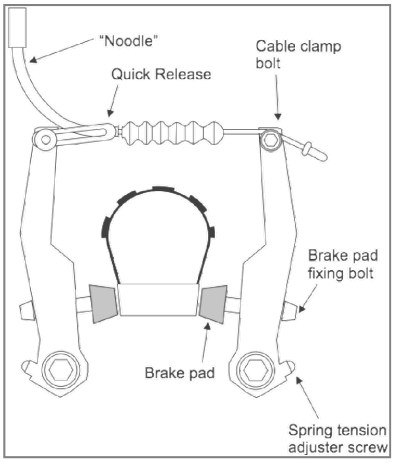
Direct-pull Cantilever Brakes

Adjust Brake Arm Tension

Now check your brake arm tension. The brake arms should have good spring tension, which makes them release when you let go of the brake lever. If there isn't much tension, you may have to increase it on both sides. Undo both bolts one at a time, but don't remove them completely.

You'll notice a small piece of metal poking out the backside of the brake. This is the spring, and it slides into one of three holes on your frame or fork. Most brakes work fine in the middle hole. To increase your brake tension, move the spring into the top hole. To decrease the brake tension, move the spring into the bottom hole. Then tighten the mounting bolt.

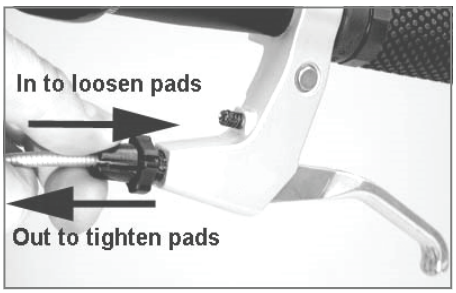
Lever Adjustment



First you'll need to loosen off your brake cable bolt. You don't need to remove it completely. This will allow you to adjust the brake lever's reach. On the lever you should see a screw or bolt on the inside close to the handlebar. This is the reach adjustment screw. As you turn this screw you'll notice the lever move closer to the handlebar grip. Turn it just enough so the rider can easily reach the lever, but not too far, as it still needs to be able to move enough to pull the brake.

Now re-adjust and tighten your brake cable. This is where the 4th hand tool comes in handy, as it will grip and pull the cable for you while you tighten the bolt.

Reach Adjustment



Once the reach is set up and the brakes are working, your child may find the lever is close enough but hard to pull. This is caused by high spring tension on the back of the brake caliper. To relieve some of this tension, you can push the spring in toward the wheel on both sides. I use an old screwdriver that I've ground down to a have a concave end just for this purpose, so it doesn't slip and gouge my knuckles. Push just enough so it gives a tiny bit. You don't want to push the springs too much as they still need some tension to pull the brakes back outward.

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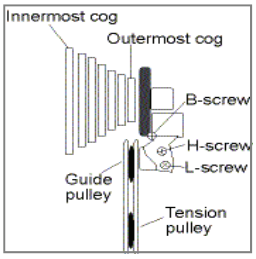
Basic Adjustments *cont'd*

Derailleur Adjustment

Limit Screws

There are 3 adjustment screws – the B-Screw (B-tension adjustment), the H-Screw (high gear limit stop) and the L-Screw (low gear limit stop). Adjustments on these screws should always be made in 1/4 turn increments.

B-Tension Adjustment

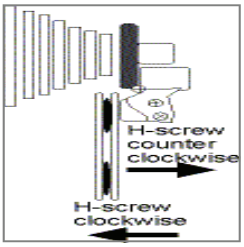


The B-Screw controls the derailleur body's angle in relation to the sprocket-set. Shift to the largest sprocket and check the distance between the guide pulley and the large sprocket. If the guide pulley is rubbing on the sprocket, tighten the B-screw clockwise to increase tension and move the pulley away from the sprocket. If there is a large gap between the pulley and sprocket, loosen the B-screw until the pulley rubs the sprocket, and then tighten it until it just clears.

High Gear Limit Stop

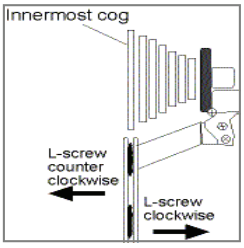
The H-Limit screw high gear limit stop prevents the guide pulley from shifting any further past the highest gear and into the axle. In order to adjust it properly there must be no tension on the lower inner cable. If you feel tension, loosen the cable adjuster until there is none. Now check from behind how the chain is riding on the smallest sprocket. If it looks like it wants ride off into the axle, tighten the H-screw clockwise until it lines up. If it looks like it is rubbing on the next gear, loosen the screw until the chain is nicely centered on the sprocket. Now re-adjust the cable tension until the derailleur shifts smoothly down to the next gear.

Low Gear Limit Stop



The L-Limit screw prevents the guide pulley from shifting any further past the lowest gear and into the wheel spokes. Shift down to the lowest gear, step behind the bike, and check how the chain rides on the sprocket. If it looks like it wants to ride into the spokes, tighten the L-screw clockwise until it is centered on the sprocket. If it looks like it wants to shift down, loosen the screw until it lines up. As an extra precaution you can use your thumb to gently push the derailleur body and make sure the chain will not run into the spokes, as this could obviously have a nasty effect on both you and your bike.

Cable Adjustment



The cable tension adjuster defines how far up or down the derailleur moves. Step back so you can see the chain and sprocket alignment, and then through the gears in both directions, first shifting up two and down one, and then down two and up one. The chain should look centered on each sprocket. If it is rubbing on a larger gear it means there is too much tension on the cable. Loosen the tension by turning the adjuster clockwise. If it wants to jump down to a smaller gear it needs more tension. Increase the tension by turning the adjuster counter-clockwise.

You can also use sound to check the adjustment. There is always a base-level of noise that can be heard in every gear. This noise will increase in a slightly different way depending on which way the tension is out of adjustment. If there is too much tension you will hear a metallic rubbing sound, but if there is too little tension you will hear a clicking noise as the chain tries to jump to a smaller sprocket. There is usually a cable tension adjuster on your shift lever. With practice you will be able to make small cable tension adjustments while you are riding.

Additional Information

Warning: This manual is not intended as a comprehensive use, service, repair or maintenance manual.

Like any sport, bicycling involves risk of injury and damage. By choosing to ride a bicycle, you assume the responsibility for that risk, so you need to know—and practice—the rules of safe and responsible riding and of proper use and maintenance of your bicycle. Proper use and maintenance of your bicycle reduces risk of injury.

This manual contains many "Warnings" and "Cautions" concerning the consequences of failure to maintain or inspect your bicycle and of failure to follow safe bicycling practices.

- The combination of the safety alert symbol and the word **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
- The combination of the safety alert symbol and the word **CAUTION** indicates a potentially hazardous situation which, if not avoided may result in minor or moderate injury, or is an alert against unsafe practices.
- The word **CAUTION** used without the safety alert symbol indicates a situation which, if not avoided, could result in serious damage to the bicycle or the voiding of your warranty.

Many of the Warnings and Cautions say "you may lose control and fall". Because any fall can result in serious injury or even death, we do not always repeat the warning of possible injury or death.

Because it is impossible to anticipate every situation or condition which can occur while riding, this Manual makes no representation about the safe use of the bicycle under all conditions. There are risks associated with the use of any bicycle which cannot be predicted or avoided, and which are the sole responsibility of the rider.

A Special Note for Parents:

As a parent or guardian, you are responsible for the activities and safety of your minor child, and the includes making sure that the bicycle is properly fitted to the child; that it is in good repair and safe operating condition; that you and your child have learned and understand the safe operation of the bicycle and that you and your child have learned , understand and obey not only the applicable local motor vehicle, bicycle and traffic laws, but also the common sense rules of safe and responsible bicycling. As a parent, you should read this manual, as well as review its warnings and the bicycle's functions and operating procedures with your child, before letting your child ride the bicycle

WARNING: Make sure that your child always wears an approved bicycle helmet when riding.

Additional Information *cont'd*

WARNING: We strongly urge you to read the Manual in its entirety before your first ride. At the very least, read and make sure that you understand each point in this section, and refer to the cited sections on any issue which you do not completely understand. Please note that not all bicycles have all of the features described in this Manual

A. Bike Fit

- Is your bike the right size? If your bicycle is too large or too small for you, you may loose control and fall. Always refer to the sizing chart supplied by KETTLER prior to purchasing your new bicycle.
- Is the saddle at the right height? If you adjust you're your saddle height, follow the Minimum Insertion instructions.
- Are saddle and seat post securely clamped? A correctly tightened saddle will allow no saddle movement in any direction.
- Are the stem and handlebars at the right height for you?
- Can you comfortably operate the brakes? If not, you may be able to adjust their angle and reach.
- Do you fully understand how to operate your new bike? If not, before your first ride, please contact KETTLER's Parts & Service Department, parts@KETTLERusa.com / 866-804-0440, with any questions and/or concerns that you may have.

B. Safety First

- Always wear an approved helmet when riding your bike, and follow the helmet manufacturer's instructions for fit, use and care.
- Do you have all the other required and recommended safety equipment? It's your responsibility to familiarize yourself with the laws of the areas where you ride, and to comply with all applicable laws.
- Do you know how to correctly secure your front and rear wheels? Riding with an improperly secured wheel can cause the wheel to wobble or disengage from the bicycle, cause serious injury or death.
- If your bike has toeclips and straps or clipless (Step-in) pedals, make sure you know how they work. These pedals require special techniques and skills. Follow the pedal manufacturer's instructions for fit, use and care.
- Do you have "toe overlap"? On smaller framed bicycles your toe or toeclip may be able to contact the front wheel when a pedal is all the way forward and the wheel is turned.
- Does your bike have suspension? If so, follow the helmet manufacturer's instructions for fit, use and care.
-

C. Mechanical Safety Check

Routinely check the condition of your bicycle before every ride

- **Nuts, bolts, screws and other fasteners:** Because manufacturers use a wide variety of fastener sizes and shapes made in a variety of materials, often differing by model and component, the correct tightening force or torque cannot be generalized. To make sure that the many fasteners on your bicycle are correctly tightened, refer to the Fastener Torque Specifications section of this catalog or to the torque specifications in

Additional Information *cont'd*

the instructions provided by the manufacturer of the component in question. Correctly tightening a fastener requires a calibrated torque wrench. A professional bicycle mechanic with a torque wrench should torque the fasteners on your bicycle. If you choose to work on your own bicycle, you must use a torque wrench and the correct tightening torque specifications from the bicycle or component manufacturer. If you need to make an adjustment at home or in the field, we urge you to exercise care, and to have the fasteners you worked on checked by a accredited bicycle mechanic as soon as possible.

WARNING: Correct tightening force on fasteners—nuts, bolts, screws—on your bicycle is important. Too little force, and the fastener may not hold securely. Too much force, and the fastener can strip threads, stretch, deform or break. Either way, incorrect tightening force can result in component failure, which can cause you to loose control and fall.

- Make sure nothing is loose. Lift the front wheel off the ground by two or three inches, then let it bounce on the ground. Anything sound, feel or look loose? Do a visual and tactile inspection of the whole bike. Any loose parts or accessories? If so, secure them. If not sure, ask someone with experience to check
- **Tires & Wheels**: Make sure tires are correctly inflated. Check by putting one hand on the saddle one on the intersection of the handlebars and stem, then bouncing your weight on the bike while looking at the tire deflection. Compare what you see with how it looks when you know the tires are correctly inflated; adjust if necessary.
- Tires in good shape? Spin each wheel slowly and look for cuts in the thread and sidewall. Replace damaged tires before riding the bike.
- Wheels true? Spin each wheel and check for brake clearance and side-to-side wobble. If a wheel wobbles side to side even slightly, or rubs against or hits the brake pads, take the bike to a qualified bike shop to have the wheel trued.
- Wheel rims clean and undamaged? Make sure the rims are clean and undamaged at

CAUTION: Wheels must be true for rim brakes to work effectively. Wheel trueing is a skill which requires special tools and experience. Do not attempt to true a wheel unless you have the knowledge, experience and tools needed to do the job correctly.

the tire bead and, if you have rim brakes, along the braking surface. Check to make sure that any rim wear indicator marking is not visible at any point on the wheel rim.

WARNING: Bicycle wheel rims are subject to wear. Ask a certified bike mechanic about wheel rim wear. Some wheel rims have a rim wear indicator which becomes visible as the rim's braking surface wears. A visible rim wear indicator on the side of the wheel rim is an indication that the end of its usable life can result in wheel failure, which can cause you to loose control and fall

Additional Information *cont'd*

- **Brakes:** Check the brakes for proper operation. Squeeze the brake levers. Are the brake quick-releases closed? All control cables seated and securely engaged? If you have rim brakes, do the brake pads contact the wheel rim squarely and make full contact with the rim? Do the brakes begin to engage within an inch of brake lever movement? Can you apply full braking force at the levers without having them touch the handlebar? If not, your brakes need adjustment. Do not ride the bike until the brakes are properly adjusted by a professional bike mechanic.
- **Wheel retention system:** Make sure the front and rear wheels are correctly secured.
- **Seat post:** If your seat post has an over-center cam action fastener for easy height adjustment, check that it is properly adjusted and in the locked position
- **Handlebar and saddle alignment:** Make sure the saddle and handlebar stem are parallel to the bike's center line and clamped tight enough so that you cannot twist them out of alignment.
- **Handlebar ends:** Make sure the handlebar grips are secure and in good condition. If not, replace them as soon as possible. Make sure the handlebar ends and extensions are plugged. If not, plug them before you ride. If the handlebars have bar end extensions, make sure they are clamped tight enough so you cannot twist them.

WARNING: Loose or damaged handlebar grips or extensions can cause you to loose control and fall. Unplugged handlebars or extensions can cut you and cause injury in an otherwise minor accident.

VERY IMPORTANT SAFETY NOTE:

Please also read and become thoroughly familiar with the important information on the Lifespan of Your Bicycle & its Components section of this manual.

D. First Ride

When you buckle on your helmet and go for your first familiarization ride on your new bike, be sure to pick a controlled environment, away from cars, other cyclists, obstacles or other hazards. Ride to become familiar with the controls, features and performance of your new bike.

Familiarize yourself with the braking action of the bike. Test the brakes at slow speed, putting your weight toward the rear and gently applying the brakes, rear brake first. Sudden or excessive application of the front brake could pitch you over the handlebars. Applying brakes too hard can lock up a wheel, which could cause you to loose control and fall. Skidding is an example of what can happen when a wheel locks up.

If your bicycle has toeclips or clipless pedals, practice getting in and out of the pedals.

If your bike has suspension, familiarize yourself with how the suspension responds to brake application and rider weight shifts.

Practice shifting the gears. Remember to never move the shifter while pedaling backward, nor pedal backwards immediately after having moved the shifter. This could jam the chain and cause serious damage to the bike.

Checkout the handling and response of the bike; and check the comfort.

If you have any questions, or if you feel anything about the bike is not as it should be, contact KETTLER's Parts & Service Department, parts@KETTLERusa.com / 866-804-0440, with any questions and/or concerns that you may have before you ride again.

Safety

A. The Basics

WARNING: The area in which you ride may require specific safety devices. It is your responsibility to familiarize yourself with the laws of the area where you ride and to comply with all applicable laws, including properly equipping yourself and your bike as the law requires.

Observe all local bicycle laws and regulations. Observe regulations about bicycle lighting, licensing of bicycles, riding on sidewalks, laws regulating bike path and trail use, helmet laws, child carrier laws, special bicycle traffic laws. Its your responsibility to know and obey the laws.

- Always wear a cycling helmet which meets the latest certification standards and is appropriate for the type of riding you do. Always follow the helmet manufacturer's instruction for fit, use and care of your helmet. Most serious bicycle injuries involve head injuries which might have been avoided if the rider had worn an appropriate helmet.
- Always do the Mechanical Safety Check before you get on a bike to ride.

WARNING: Failure to wear a helmet when riding may result in serious injury or death.

- Be thoroughly familiar with the controls of your bicycle: brakes, pedals, shifting.
- Be careful to keep body parts and other objects away from the sharp teeth of chainring, the moving chain, the turning pedals and cranks, and the spinning wheels of your bicycle.
- Always wear:
  - ◊ Shoes that will stay on your feet and will grip the pedals. Make sure that show laces cannot get into moving parts, and never ride barefoot or in sandals.
  - ◊ Bright, visible clothing that is not so loose that it can be tangled in the bicycle or snagged by objects at the side of the road or trail.
  - ◊ Protective eyewear, to protect against airborne dirt, dust and bugs—tinted when the sun is bright, clear when its not.
- Don't jump with your bike. Jumping a bike, particularly a BMX or mountain bike, can be fun; but it can put huge and unpredictable stress on the bicycle and its components. Riders who insist on jumping their bikes risk serious damage, to their bicycles as well as to themselves. Before you attempt to jump, do stunt riding or race with your bike, read and understand the Extreme, Stunt or Competition Riding section of this manual.
- Ride at a speed appropriate for conditions. Higher speed means higher risk.

B. Riding Safety

- Obey all rules of the road and all local laws.
- You are sharing the road or the path with others—motorists, pedestrians and other cyclists. Respect their rights.
- Ride defensively. Always assume that others do not see you.
- Look ahead, and be ready to avoid:

- ◊ Vehicles slowing or turning, entering the road or your lane ahead of you, or coming up behind you.
- ◊ Parked car doors opening.
- ◊ Pedestrians stepping out.
- ◊ Children or pets playing near the road.
- ◊ Potholes, sewer grating, railroad tracks, expansion joints, road or sidewalk construction, debris and other obstructions that could cause you to swerve into traffic, catch your wheel or cause you to have an accident.
- ◊ The many other hazards and distractions which can occur on a bicycle ride.

- Ride in designated bike lanes, on designated bike paths or as close to the edge of the road as possible, in the direction of traffic flow or as directed by local governing laws.
- Stop at stop signs and traffic lights; slow down and look both ways at street intersections. Remember that a bicycle always loses in a collision with a motor vehicle, so be prepared to yield even if you have the right of way.
- Use approved hand signals for turning and stopping.
- Never ride with headphones. They mask traffic sounds and emergency vehicle sirens, distract you from concentrating on what's going on around you, and their wires can tangle in the moving parts of the bike, causing you to lose control and fall.
- Never carry a passenger, unless it is a small child wearing an approved helmet and secured in a correctly mounted child carrier or a child-carrying trailer
- Never carry anything which obstructs your vision or your complete control of the bicycle, or which could become entangled in the moving parts of the bicycle.
- Never hitch a ride by holding on to another vehicle.
- Don't do stunts, wheelies or jumps. If you intend to do stunts, wheelies, jumps or go racing with your bike despite KETTLER's advice not to, read the Extreme, Stunt or Competition Riding section of this manual, now. Think carefully about your skills before deciding to take the large risks that go with this kind of riding.
- Don't weave through traffic or make any moves that may surprise people with whom you are sharing the road.
- Observe and yield the right of way.
- Never ride your bicycle while under the influence of alcohol or drugs.
- If possible, avoid riding in bad weather, when visibility is obscured, at dawn, dusk or in the dark, or when extremely tired. Each of these conditions increases the risk of accident.

C. Off-Road Safety

We recommend that children not ride on rough terrain unless they are accompanied by an adult.

- The variable conditions and hazards of off-road riding require close attention and specific skills. Start slowly on easier terrain and build up your skills. If your bike has suspension, the increased speed you may develop also increases your risk of losing control and falling. Get to know how to handle your bike safely before trying to increased speed or more difficult terrain.
- Wear safety gear appropriate to the kind of riding you plan to do.
- Don't ride alone in remote areas. Even when riding with others, make sure that someone knows where you're going and when you expect to be back
- Always take along some kind of identification, so that people know who you are in case of an accident; take along some food, a cool drink or an emergency phone call.

- Yield right of way to pedestrians and animals. Ride in a way that does not frighten or endanger them, and give them room so that their unexpected moves don't endanger you.
- Be prepared. If something goes wrong while you're riding off-road, help may not be close.
- Before you attempt to jump, do stunt riding or race with your bike, read and understand the Extreme, Stunt or Competition Riding section of this manual.

Off-Road Respect

Obey the local laws regulating where and how you can ride off-road, and respect private property. You may be sharing the trail with others—hikers, equestrians, other cyclists. Respect their rights. Stay on the designated trail. Don't contribute to erosion by riding in mud or with unnecessary sliding. Don't disturb the ecosystem by cutting your own trail or shortcut through vegetation or streams. It is your responsibility to minimize your impact on the environment. Leave things as you found them; always take out everything you brought in.

D. Wet Weather Riding

WARNING: Wet weather impairs traction, braking and visibility, both for the bicyclist and for other vehicles sharing the road. The risk of an accident is dramatically increased in wet conditions.

Under wet conditions, the stopping power of your brakes (as well as the brakes of other vehicles sharing the road) is dramatically reduced and your tires don't grip nearly as well. This makes it harder to control speed and easier to lose control. To make sure that you can slow down and stop safely in wet conditions, ride more slowly and apply your brakes earlier and more gradually than you would under normal, dry conditions.

E. Night Riding

Riding a bicycle at night is *much* more dangerous than riding during the day. A bicyclist is very difficult for motorists and pedestrians to see at night. Therefore, children should never ride at dawn, at dusk or at night. Adults who chose to accept the greatly increased risk of riding at dawn, at dusk or at night need to take extra care both riding and choosing specialized equipment which helps reduce that risk. Consult an accredited bicycle shop about night riding safety equipment.

WARNING: Reflectors are not a substitute for required lights. Riding at dawn, at dusk, at night or at other times of poor visibility without an adequate bicycle lighting system and without reflectors is dangerous and may result in serious injury or death.

Bicycle reflectors are designed to pick up and reflect car lights and street lights in a way that may help you to be seen and recognized as a moving bicyclist.

WARNING: Check reflectors and their mounting brackets regularly to make sure that they are clean, straight, unbroken and securely mounted. Have an accredited bike mechanic replace damaged reflectors and straighten or tighten any that are bent or loose.

The mounting brackets of front and rear reflectors are often designed as brake straddle cable safety catches which prevent the straddle cable from catching on the tire tread if the cable jumps out of its yoke or breaks.

WARNING: Do not remove the front or rear reflectors or reflector brackets from your bicycle. They are an integral part of the bicycle's safety system.

Removing the reflectors reduces your visibility to others using the roadway. Being struck by other vehicles may result in serious injury or death.

The reflector brackets may protect you from a brake straddle cable catching on the tire in the event of brake cable failure. If a brake straddle cable catches on the tire, it can cause the wheel to stop suddenly, causing you to loose control and fall.

If you choose to ride under conditions of poor visibility, check and be sure you comply with all local laws about night riding, and take the following strongly recommended additional precautions:

- ◊ Purchase and install battery or generator powered head and tail lights which meet all regulatory requirements and provide adequate visibility.
- ◊ Wear light colored, reflective clothing and accessories, such as a reflective vest, reflective arm and leg bands, reflective stripes on your helmet, flashing lights attached to your body and/or your bicycle…any reflective device or light source that moves will help you get the attention of approaching motorists, pedestrians and other traffic.
- ◊ Make sure your clothing or anything you may be carrying on the bicycle does not obstruct a reflector or light.
- ◊ Make sure that your bicycle is equipped with correctly positioned and securely mounted reflectors.

While riding at dawn, at dusk or at night:

- ◊ Ride slowly.
- ◊ Avoid dark areas and areas of heavy or fast-moving traffic.
- ◊ Avoid road hazards.
- ◊ If possible, ride on familiar routes.

If riding in traffic:

- ◊ Be predictable. Ride so that drivers can see you and predict your movements.
- ◊ Be alert. Ride defensively and expect the unexpected.
- ◊ If you plan to ride in traffic often, ask a certified dealer about traffic safety classes or a good book on bicycle traffic safety.

F. Extreme, Stunt or Competition Riding

Whether you call it Aggro, Hucking, Freeride, North Shore, Downhill, Jumping, Stunt Riding, Racing or something else: if you engage in this sort of extreme, aggressive riding *you **will** get hurt*, and you voluntarily assume a greatly increased risk of injury or death.

Not all bicycles are designed for these types of riding, and those that are may not be suitable for all types of aggressive riding. Check with KETTLER about the suitability of your bicycle before engaging in extreme riding.

When riding fast down hill, you can reach speeds achieved by motorcycles, and therefore face similar hazards and risks. Have your bicycle and equipment carefully inspected by a qualified mechanic and be sure it is in perfect condition. Consult with expert riders, area site personnel and race officials on conditions and equipment advisable at the site where you plan to ride. Wear appropriate safety gear, including an approved full face helmet, full finger gloves, and body armor.

Safety *cont'd*

Ultimately, it is your responsibility to have proper equipment and to be familiar with course conditions.

WARNING: Although many catalogs, advertisements and articles about cycling depict riders engaged in extreme riding, this activity is extremely dangerous, increases your risk of injury or death, and increases the severity of any injury. Remember that the action depicted is being performed by professionals with many years of training and experience. Know your limits and always wear a helmet and other appropriate safety gear. Even with state-of-the-art protective gear, you could be seriously injured or killed when jumping, stunt riding, riding downhill at speed or in competition.

WARNING: Bicycles and bicycle parts have limitations with regards to strength and integrity, and this type of riding can exceed those limitations.

We recommend against this type of riding because of the increased risks; but if you choose to take the risk, at least:

- Take lessons from a competent instructor first.
- Start with easy learning exercises and slowly develop your skills before trying more difficult or dangerous riding.
- Use only designated areas for stunt, jumping, racing or fast downhill riding.
- Wear a full face helmet, safety pads and other safety gear.
- Understand and recognize that the stresses imposed on your bike by this kind of activity break or damage parts of the bicycle and void the warranty.
- Take your bicycle to a bicycle mechanic if anything breaks or bends. Do not ride your bicycle when any part is damaged.

If you ride downhill at speed, do stunt riding or ride in competition, know the limits of your skills and experience. Ultimately, avoiding injury is your responsibility.

G. Changing Components or Adding Accessories

There are many components and accessories available to enhance the comfort. Performance and appearance of your bicycle. However, if you change components or add accessories, you do so at your own risk. Chances are, KETTLER may not have tested that component or accessory for compatibility, reliability or safety on your bicycle. Before installing any component or accessory, including a different size tire, make sure that it is compatible with your bicycle by contacting KETTLER's Parts & Service Department, parts@KETTLERusa.com or 866-804-0440. be sure to read, understand and follow the instructions that accompany the products you purchase for your bicycle.

WARNING: Failure to confirm compatibility, properly install, operate and maintain any component or accessory can result in serious injury or death.

WARNING: Changing the components on your bike with other than genuine replacement parts may compromise the safety of your bicycle and may void the warranty. Check with Parts & Service Department, parts@KETTLERusa.com or 866-804-0440, before changing the components on your bike.

Fit

NOTE: Correct fit is an essential element of bicycling safety, performance and comfort. Making the adjustments to your bicycle which result in correct fit for your body and riding conditions requires experience, skill and special tools. Always have a bicycle mechanic make the adjustments on your bicycle; or, if you have the experience, skills and tools, have a bicycle mechanic check your work before riding.

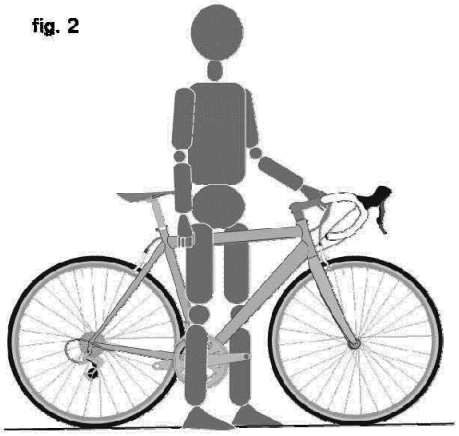
WARNING: If your bicycle does not fit properly, you may lose control and fall.

A. Standover Height

- **Diamond and Trapezoid Frame Bicycles**

Standover height is the basic element of bike fit (fig. 2). It is the distance from the ground to the top of the bicycle's frame at the point where your crotch is when straddling the bike. To check for correct standover height, straddle the bike while wearing the kind of shoes in which you'll be riding, and bounce vigorously on the heels. If your crotch touches the frame, the bike may be too big for you. A bike which you ride only on paved surfaces and never taken off-road should give you a minimum standover height clearance of two inches (5cm). A bike that you'll ride on unpaved surfaces should give you a minimum of three inches (7.5cm) of standover height clearance. And a bike that you'll use off-road should give you four inches (10cm) or more of clearance.

fig. 2



- **Step-through Frame Bicycles**

Standover height does not apply to bicycles with step-through frames. Instead, the limiting dimension is determined by saddle height range. You must be able to adjust your saddle position as described **B** without exceeding the limits set by the height of the top of the seat tube and the "minimum Insertion" or Maximum Extension" mark on the seat post.

B. Saddle Position

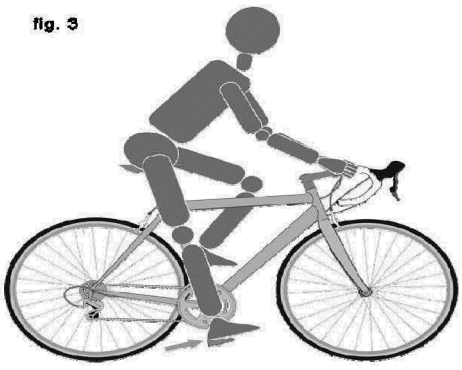
Correct saddle adjustment is an important factor in getting the most performance and comfort from your bicycle. If the position is not comfortable for you, visit an accredited bicycle dealer for help.

The saddle can be adjusted in three directions:

1. **Up and down adjustment.** To check for the correct saddle height (fig. 3):
   - ◊ Sit on the saddle;
   - ◊ Place one heel on a pedal;
   - ◊ Rotate the crank until the pedal with your heel on it is in the down position and the crank arm is parallel to the seat tube.

If your leg is completely straight, your saddle height needs to be adjusted. If your hips must rock for the heel to reach the pedal, the saddle is too high. If your leg is bent at the knee with your heel on the pedal, the saddle is too low.

fig. 3



Fit *cont'd*

Ask an accredited bike mechanic to set the saddle for optimal riding position and to show you how to make this adjustment. If you choose to make your own saddle height adjustment:

- ◊ Loosen the seat post clamp.
- ◊ Raise or lower the seat post in the seat tube.
- ◊ Make sure the saddle is straight fore and aft.
- ◊ Re-tighten the seat post clamp to the recommended torque.

Once the saddle is at the correct height, make sure that the seat post does not project from the frame beyond its "Minimum Insertion" or "Maximum Extension" mark (fig. 4).

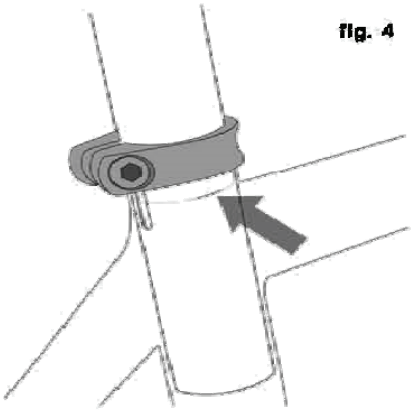


fig. 4

NOTE: Some bicycles have a sight hole in the seat tube, the purpose of which is to make it easy to see whether the seat post is inserted in the seat tube far enough to be safe. If your bicycle has such a sight hole, use it instead of the "Minimum Insertion" or "Maximum Extension" mark to make sure the seat post is inserted in the seat tube far enough to be visible through the sight hole.

If your bike has an interrupted seat tube, as is the case on some suspension bikes, you must also make sure that the seat post is far enough into the frame so that you can touch it through the bottom of the interrupted seat tube with the tip of your finger without inserting your finger beyond its first knuckle (see NOTE above and fig. 5).

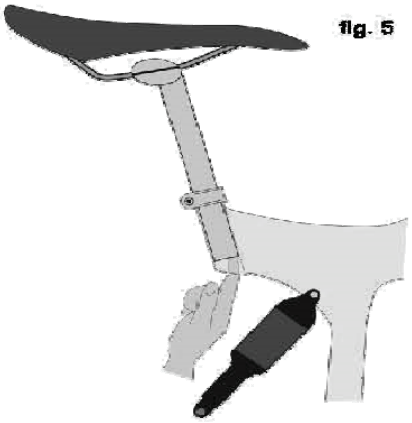


fig. 5

WARNING: If your seat post is not inserted in the seat tube as described in B. 1, the seat post may break, which could cause you to lose control and fall.

2. **Front and back adjustment.** The saddle can be adjusted forward or back to help you get the optimal position on the bike. Ask a certified bike mechanic to set the saddle for your optimal riding position and to show you how to make this adjustment. If you choose to make your own front and back adjustment, make sure that the clamp mechanism is clamping on the straight part of the saddle rails and is not touching the curved part of the rails, and you are using the recommended torque on the clamping fastener (s).

3. **Saddle angle adjustment.** Most people prefer a horizontal saddle; but some riders like the saddle nose angled up or down slightly. An accredited dealer can adjust saddle angle or show you how to do it. If you choose to make your own saddle angle adjustment and you have a single bolt saddle clamp on your seat post, it is critical that you loosen the clamp bolt sufficiently to allow any serrations on the mechanism to disengage before changing the saddle's angle, and then that the serrations fully re-engage before you tighten the clamp bolt to the recommended torque.

Fit *cont'd*

WARNING: When making saddle angle adjustments with a single bolt saddle clamp, always check to make sure that the serrations on the mating surfaces of the clamp are not worn. Worn serrations on the clamp can allow the saddle to move, causing you to lose control and fall.

Always tighten fasteners to the correct torque. Bolts that are too tight can stretch and deform. Bolts that are too loose can move and fatigue.

Each mistake can lead to a sudden failure of the bolt, causing you to lose control and fall.

NOTE: If your bicycle is equipped with a suspension seat post, the suspension mechanism may require periodic service or maintenance. Ask an accredited bike mechanic for recommended service intervals for your suspension seat post

Small changes in saddle position can have a substantial effect on performance and comfort. To find your best saddle position, make one adjustment at a time.

WARNING: After any saddle adjustment, be sure that the saddle adjusting mechanism is properly seated and tightened before riding. A loose saddle clamp or seat post clamp can cause damage to the seat post, or can cause you to lose control and fall. A correctly tightened saddle adjusting mechanism will allow no saddle movement in any direction. Periodically check to make sure that the saddle adjusting mechanism is properly tightened.

If, in spite of carefully adjusting the saddle height, tilt and fore-and-aft position, your saddle is still uncomfortable, you may need a different saddle design.
Saddles, like people, come in many different shapes, sizes and resilience. A certified bike mechanic can help you select a saddle which, when correctly adjusted for your body and riding style, will be comfortable.

WARNING: Some studies have claimed that extended riding with a saddle which is incorrectly adjusted or which does not support your pelvic area correctly can cause short-term or long-term injury to nerves and blood vessels, or even impotence. If your saddle causes you pain, numbness or discomfort, listen to your body and stop riding until you see a certified bike mechanic about saddle adjustment or a different saddle.

C. Handlebar Height and Angle

Your bike is equipped either with a "threadless" stem, which clamps on the outside of the steerer tube, or a "quill" stem, which clamps inside the steerer tube by way of an expanding binder bolt. If you aren't absolutely sure which type of stem your bike has, ask a certified bike mechanic.

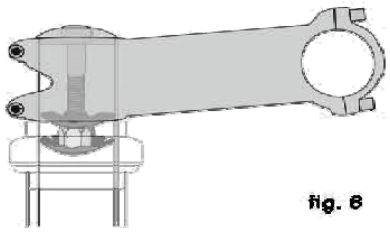


fig. 6

If your bike has a "threadless" stem (fig. 6) you may be able to change handlebar height by moving height adjustment spacers from below the stem to above the stem, or vise versa. Otherwise, you'll have to get a stem of different length or rise. Consult a bike mechanic. Do not attempt to do this yourself, as it requires special knowledge.

Fit *cont'd*

If your bike has a "quill" stem (fig. 7) you can ask a bike mechanic to adjust the handlebar height a bit by adjusting stem height.

A quill stem has an etched or stamped mark on its shaft which designates the stem's "Minimum Insertion" or "Maximum Extension". This mark must not be visible above the headset.

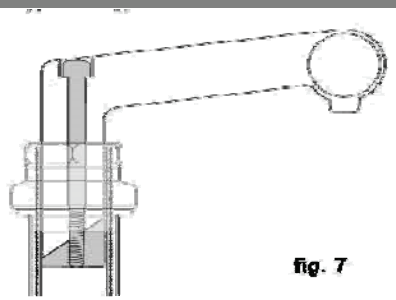


fig. 7

WARNING: A quill stem's Minimum Insertion mark must not be visible above the top of the headset. If the stem is extended beyond the Minimum Insertion mark the stem may break or damage the fork's steerer tube, which could cause you to lose control and fall.

WARNING: On some bicycles, changing the stem or stem height can affect the tension of the front brake cable, locking the front brake or creating excess cable slack which can make the front brake inoperable. If the front brake pads move in towards the wheel rim or out away from the wheel rim when the stem or stem height is changed, the brakes must be correctly adjusted before you ride the bicycle.

Some bicycles are equipped with an adjustable angle stem. If your bicycle has an adjustable angle stem, ask a certified bike mechanic to show you how to adjust it. Do not attempt to make the adjustment yourself, as changing stem angle may also require adjustments to the bicycle's controls.

WARNING: Always tighten fasteners to the correct torque. Bolts that are too tight can stretch and deform. Bolts that are too loose can move and fatigue. Either mistake can lead to a sudden failure of the bolt, causing you to lose control and fall.

A certified bike mechanic can also change the angle of the handlebar or bar end extensions.

WARNING: An insufficiently tightened clamp bolt, handlebar clamp bolt or bar end extension clamping bolt may compromise steering action, which could cause you to lose control and fall. Place the front wheel of the bicycle between your legs and attempt to twist the handlebar/stem assembly. If you can twist the stem in relation to the front wheel, turn the handlebars in relation to the stem, or turn the bar end extensions in relation to the handlebar, the bolts are insufficiently tightened.

D. Control Position Adjustments

The angle of the brake and shift control levers and their position on the handlebars can be changed. Ask a certified mechanic to make the adjustments for you. If you choose to make your own control lever angle adjustment, be sure to retighten the clamp fasteners to the recommended torque.

Fit *cont'd*

E. Brake Reach

Many bikes have brake levers which can be adjusted for reach. If you have small hands or find it difficult to squeeze the brake levers, a certified bike mechanic can either adjust the reach or fit shorter reach brake levers.

WARNING: The shorter the brake lever reach, the more critical it is to have correctly adjusted brakes, so full braking power can be applied within available brake lever travel. Brake lever travel insufficient to apply full braking power can result in serious injury or death.

Tech

NOTE: It's important to your safety, performance and enjoyment to understand how things work on your bicycle. We urge you to ask a certified bike mechanic how to do the things described in this section before you attempt them yourself, and that you have a certified bike mechanic check your work before you ride you the bike. If you have even the slightest doubt as to whether you understand something in this section of the manual, talk to a certified bike mechanic.

A. Wheels

Bicycle wheels are designed to be removable for easier transportation and for repair of a tire puncture. In most cases, the wheel axles are inserted into slots, called "dropouts" in the fork and frame, but some suspension mountain bikes use what is called a "through axle" wheel mounting system.

If you have a mountain bike equipped with through axle front or rear wheels, make sure that you have the manufacturer's instructions, and follow those when installing or removing a through axle wheel. If you don't know what a through axle is, ask your certified bike mechanic.

Wheels are secured in one of three ways:

1. A hollow axle with a shaft ("skewer") running through it which has an adjustable tension nut on one end and an over-center cam on the other (cam action system, fig. 8a & 8b).

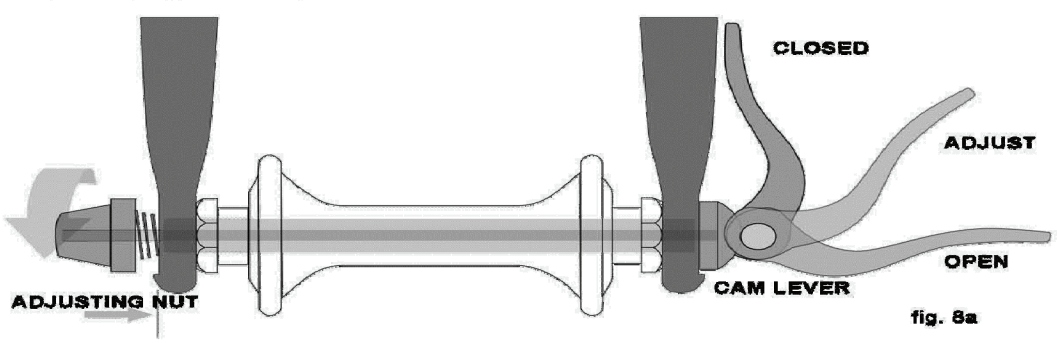


fig. 8a

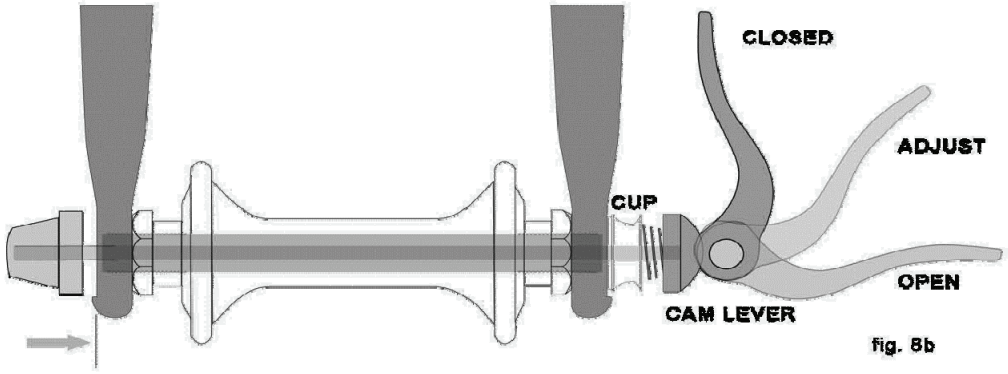


fig. 8b

2. A hollow axle with a shaft ("skewer") running through it which has a nut on one end and a fitting for a hex key, lock lever or other tightening device on the other (through bolt, fig. 9)

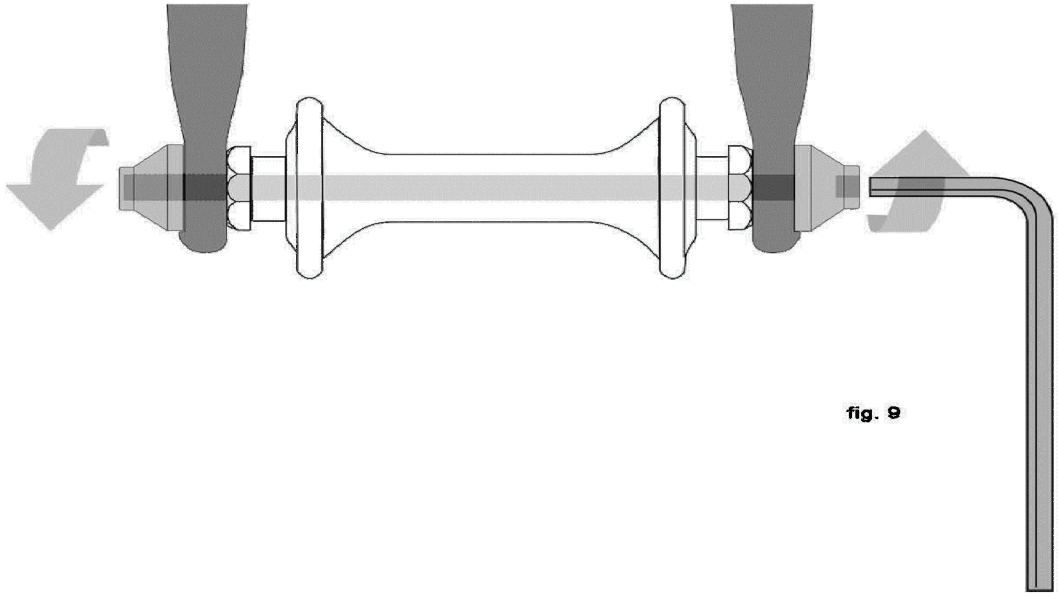


fig. 9

3. Hex nuts or hex key bolts which are threaded on to or into the hub axle (bolt-on wheel, fig. 10)

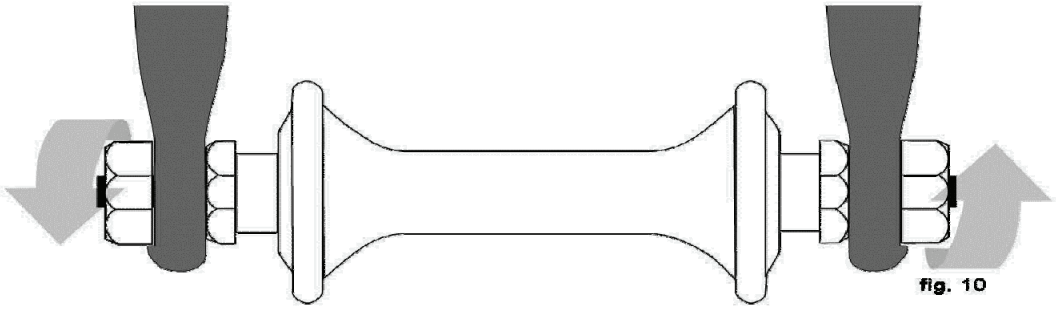


fig. 10

Your bicycle may be equipped with a different securing method for the front wheel than for the rear wheel. Discuss the wheel securing method for your bicycle with your local certified bike mechanic.

It is very important that you understand the type of wheel securing method on your bicycle, that you know how to secure the wheels correctly, and that you know how to apply the correct clamping force that safely secures the wheel. Ask your local certified mechanic to instruct you in correct wheel removal and installation, and ask them to give you any available manufacturer's instructions.

Tech *cont'd*

WARNING: Riding with an improperly secured wheel can allow the wheel to wobble or fall off of the bicycle, which can cause serious injury or death. Therefore, it is essential that you:

1. Ask a certified bike mechanic to help you make sure you know how to install and remove your wheels safely.
2. Understand and apply the correct technique for clamping your wheel in place.
3. Each time, before you ride the bike, check that the wheel is securely clamped.

The clamping action of a correctly secured wheel must emboss the surfaces of the dropouts.

1. Front Wheel Secondary Retention Devices

Most bicycles have front forks which utilize a secondary wheel retention device to reduce the risk of the wheel disengaging from the fork if the wheel is incorrectly secured. Secondary retention devices are not a substitute for correctly securing your front wheel.

Secondary retention devices fall into two basic categories:

A. The clip-on type is a part which the manufacturer adds to the front wheel hub or front fork

B. The integral type is molded, cast or machined into the outer faces of the front fork dropouts.

WARNING: Do not remove or disable the secondary retention device. As its name implies, it serves as a back-up for a critical adjustment. If the wheel is not secured correctly, the secondary retention device can reduce the risk of the wheel disengaging from the fork. Removing or disabling the secondary retention device will also void the warranty.

Secondary retention devices are not a substitute for correctly securing your wheel. Failure to properly secure the wheel can cause the wheel to wobble or disengage, which could cause you to loose control and fall, resulting in serious injury or death.

2. Wheels with Cam Action Systems

There are currently two types of over-center cam wheel retention mechanisms: the traditional over-center cam (fig. 8a) and the cam-and-cup system (fig. 8b). Both use an over-center cam action to clamp the bike's wheel in place. Your bicycle may have a cam-and-cup front wheel retention system and a traditional rear wheel cam action system.

A. **Adjusting the traditional cam action mechanism (fig. 8a)**

The wheel hub is clamped in place by the force of the over-center cam pushing against one dropout and pulling the tension adjusting nut, by way of the skewer, against the other dropout. The amount of clamping force is controlled by the tension adjusting nut. Turning the tension adjusting nut clockwise while keeping the cam lever from rotating increases clamping force; turning it counterclockwise while keeping the cam lever from rotating reduces clamping force. Less than half a turn of the tension adjusting nut can make the difference between safe clamping force and unsafe clamping force.

WARNING: The full force of the cam action is needed to clamp the wheel securely. Holding the nut with one hand and turning the lever like a wing nut with the other hand until everything is as tight as you can get it will not clamp a cam action wheel safely in the dropouts. See also first WARNING in this section.

B. **Adjusting the Cam-and Cup Mechanism (fig. 8b)**

The cam-and-cup system on your front wheel will have been correctly adjusted for your bicycle by the manufacturer. Ask a certified bike mechanic to check the adjustment every six months. **Do not use a cam-and-cup front wheel on any bicycle other than the one for which your manufacturer adjusted it.**

3. Removing and Installing Wheels

WARNING: If your bike is equipped with a hub brake such as a rear coaster brake, front or rear drum, band or roller brake; or if it has an internal gear hub, do not attempt to remove the wheel. The removal and re-installation of most hub brakes and internal gear hubs requires special knowledge. Incorrect removal or assembly can result in brake or gear failure, which can cause you to lose control and fall.

CAUTION: If your bike has a disc brake, exercise care in touching the rotor or caliper. Disc rotors have sharp edges, and both rotor and caliper can get very hot during use

A. **Removing a Disc Brake or Rim Brake Front Wheel**

1. If your bike has rim brakes, disengage the brakes quick-release mechanism to increase the clearance between the tire and the brake pads (fig. 11-15).
2. If your bike has a cam action front wheel retention, move the cam lever from the locked or CLOSED position to the OPEN position (fig. 8a &b). If your bike has through bolt or bolt-on front wheel retention, loosen the fastener (s) a few turns counter-clockwise using an appropriate wrench, lock key or the integral lever.
3. If your front fork has a clip-on type secondary retention device, disengage it and go to step 4. If your front fork has an integral secondary retention device, and a traditional cam action system (fig. 8a) loosen the tension adjusting nut enough to allow removing the wheel from the dropouts. If your front wheel uses a cam-and-cup system (fig. 8b), squeeze the cup and cam lever together while removing the wheel. No rotation of any part is necessary with the cam-and-cup system.

You may need to tap the top of the wheel with the palm of your hand to release the wheel from the front fork.

B. **Installing a Disc Brake or Rim Brake Front Wheel**

CAUTION: If your bike is equipped with a front disc brake, be careful not to damage the disc, caliper or brake pads when re-inserting the disc into the caliper. Never activate a disc brake's control lever unless the disc is correctly inserted in the caliper.

1. If your bike has cam action front wheel retention, move the cam lever so that it curves away from the wheel (fig. 8b). This is the OPEN position. If your bike has a through bolt or bolt-on front wheel retention, go to the next step.
2. With the steering fork facing forward, insert the wheel between the fork blades so that the axle seats firmly at the top of the fork dropouts. The cam lever, if there is one, should be on the rider's left side of the bicycle (fig. 8a & b). If your bike has a clip-on type secondary retention device, engage it.
3. If you have a traditional cam action mechanism: holding the cam lever in the ADJUST position with your right hand, tighten the tension adjusting nut with your left hand until it is finger tight against the fork dropout (fig. 8a). If you have a cam-and-cup system: the nut and cup (fig. 8b) will have snapped into the recessed area of the fork dropouts and no adjustment should be required.
4. While pushing the wheel firmly to the top of the slots in the fork dropouts, and at the same time centering the wheel rim in the fork:
    1) With a cam action system, move the cam lever upwards and swing it into the CLOSED position (fig. 8a & b). The lever should now be parallel to the fork blade and curved toward the wheel. To apply enough clamping force, you should wrap your fingers around the fork blade for leverage, and the lever should leave a clear imprint in the palm of your hand.
    2) With a through-bolt or bolt-on system, tighten the fasteners to the correct torque specifications or the hub manufacturer's instructions.

NOTE: If, on a traditional cam action system, the lever cannot be pushed all the way to a position parallel to the fork blade, return to the OPEN position. Then turn the tension adjusting nut counterclockwise one-quarter turn and try tightening the lever again.

5. With a through-bolt or bolt-on system, tighten the fasteners to the correct torque specifications or the hub manufacturer's instructions.
6. If you disengaged the brake quick-release mechanism, re-engage it to restore correct brake pad-to-rim clearance.
7. Spin the wheel to make sure that it is centered in the frame and clears the brake pads; then squeeze the brake lever and make sure that the brakes are operating correctly.

WARNING: Securely clamping the wheel with a cam action retention device takes considerable force. If you can fully close the cam lever without wrapping your fingers around the fork blade for leverage, the lever does not leave a clear imprint in the palm of your hand, and the dropouts, the tension is insufficient. Open the lever; turn the tension adjusting nut clockwise a quarter turn; then try again. See also the first WARNING in this section.

C. **Removing a Disc Brake or Rim Brake Wheel**

1. If you have a multi-speed bike with a derailleur gear system; shift the rear derailleur to the high gear (the smallest. Outermost rear sprocket).

    If you have an internal gear rear hub, consult a certified bike mechanic or the hub manufacturer's instructions before attempting to remove the rear wheel.

    If you have a single speed bike with rim or disc brakes, go to step 4.

2. If your bike has rim brakes, disengage the brake's quick-release mechanism to increase the clearance between the wheel rim and the brake pads.
3. On a derailleur gear system, pull the derailleur body back with your right hand.
4. With a cam action mechanism, move the quick-release lever to the OPEN position (fig. 8b). With a through bolt or bolt-on mechanism, loosen the fastener (s) with an appropriate wrench, lock lever or integral lever; then push the wheel forward far enough to be able to remove the chain from the rear sprocket.
5. Lift the rear wheel off the ground a few inches and remove it from the rear dropouts.

D. **Installing a disc Brake or Rim Brake Rear Wheel**

1. With a cam action system, move the cam lever to the OPEN position (fig. 8a & b). The lever should be on the side of the wheel opposite the derailleur and freewheel sprockets.
2. On a derailleur bike, make sure that the rear derailleur is still in its outermost, high gear, position; then pull the derailleur body back with your right hand. Put the chain on top of the smallest freewheel sprocket.
3. On a single-speed, remove the chain from the front sprocket, so that you have plenty of slack in the chain. Put the chain on the rear wheel sprocket.
4. Then, insert the wheel into the frame dropouts and pull it all the way in to the dropouts.
5. On a single-speed or internal gear hub, replace the chain on the chainring; pull the wheel back in the dropouts so that it is straight in the frame and the chain has about 1/4 inches of up-and-down play.
6. With a cam action system, move the cam lever upwards and swing it into the CLOSED position (fig. 8a & b). The lever should now be parallel to the seat stay or chain stay and curved toward the wheel. To apply enough clamping force, you should have to wrap your fingers around the fork blade for leverage, and the lever should leave a clear imprint in the palm of your hand.
7. With a through-bolt or bolt-on system, tighten the fasteners to the correct torque specifications or the hub manufacturer's instructions.

NOTE: If, on a traditional cam action system, the lever cannot be pushed all the way to a position parallel to the seat stay or chain stay, return the lever to the OPEN position. Then turn the tension adjusting nut counterclockwise one-quarter turn and try tightening the lever again.

CAUTION: If your bike is equipped with a rear disc brake, be careful not to damage the disc, caliper or brake pads when re-inserting the disc into the caliper. Never activate a disc brake's control lever unless the disc is correctly inserted in the caliper.

WARNING: Securely clamping the wheel with a cam action retention device takes considerable force. If you can fully close the cam lever without wrapping your fingers around the seat stay or chain stay for leverage, the lever does not leave a clear imprint in the palm of your hand, and the serrations on the wheel fastener do not emboss the surfaces o the dropouts, the tension is insufficient. Open the lever; turn the tension adjusting nut clockwise a quarter turn; then try again. See also the first WARNING in this section.

8. If you disengaged the brake quick-release mechanism, re-engage it to restore correct brake pad-to-rim clearance.
9. Spin the wheel to make sure that it is centered in the frame and clears the brake pads; then squeeze the brake lever and make sure that the brakes are operating correctly.

B. Seat Post Cam Action Clamp

Some bikes are equipped with a cam action seat post binder. The seat post cam binder works exactly like the traditional wheel cam action fastener. While a cam action binder looks like a long bolt with a lever on one end and a nut on the other, the binder uses an over-center cam action to firmly clamp the seat post (see fig. 8a).

WARNING: Riding with an improperly tightened seat post can allow the saddle to turn or move and cause you to lose control and fall. Therefore:

1. Ask a certified bike mechanic to help you make sure you know how to correctly clamp your seat post.
2. Understand and apply the correct technique for clamping your seat post.
3. Before you ride the bike, first check that the seat post is securely clamped.

Adjusting the Seat Post Cam Action Mechanism

The action of the cam squeezes the seat collar around the seat post to hold the seat post securely in place. The amount of clamping force is controlled by the tension adjusting nut. Turning the tension adjusting nut clockwise while keeping the cam lever from rotating increases clamping force; turning it counterclockwise while keeping the cam lever from rotating reduces clamping force. Less than half a turn of the tension adjusting nut can make the difference between safe and unsafe clamping force.

WARNING: The full force of the cam action is needed to clamp the seat post securely. Holding the nut with one hand and turning the lever like a wing nut with the other hand until everything is as tight as you can get it will not clamp the seat post safely.

WARNING: If you can fully close the cam lever without wrapping your fingers around the seat post or frame tube for leverage, and the lever does not leave a clear imprint in the palm of your hand, the tension is insufficient. Open the lever; turn the tension adjusting nut clockwise a quarter turn; then try again.

C. Brakes

There are three general types of bicycle brakes; rim brakes, which operate by squeezing the wheel rim between two brake pads; disc brakes, which operate by squeezing a hub-mounted disc between two brake pads; and internal hub brakes. All three can be operated by way of a handlebar mounted lever. On some models of bicycle, the internal hub brake is operated by pedaling backwards. This is called a Coaster Brake and is described in this manual in a further section.

Tech *cont'd*

WARNING:

1. Riding with improperly adjusted brakes, worn pads, or wheels on which the rim wear mark is visible is dangerous and can result in serious injury or death.
2. Applying brakes too hard or too suddenly can lock up a wheel, which could cause you to lose control and fall. Sudden or excessive application of the front brake may pitch the rider over the handlebars, which may result in serious injury or death.
3. Some bicycle brakes, such as disc brakes (fig. 11) and linear-pull brakes (fig. 12), are extremely powerful. Take extra care when using them.
4. Some bicycle brakes are equipped with a brake force modulator, a small, cylindrical device through which the brake control cable runs and which is designed to provide a more progressive application of braking force. A modulator makes the initial brake lever force more gentle, progressively increasing force until full force is achieved. If your bike is equipped with a brake force modulator, take extra care in becoming familiar with its performance characteristics.
5. Disc brakes can get extremely hot with extended use. Be careful not to touch a disc brake until it has had plenty of time to cool.
6. See the brake manufacturer's instructions for operation and care of your brakes, and for when brake pads must be replaced. If you do not have a manufacturer's instructions, contact Kettler's Parts & Service, parts@kettlerusa.com / 866-804-0440.
7. If replacing worn or damaged parts, use only manufacturer-approved genuine replacement parts.

A. **Brake Controls and Features**

Its very important to your safety that you learn and remember which brake lever controls which brake your bike. Traditionally, the right brake lever controls the rear brake and the left brake lever controls the front brake; but, to make sure your bike's brakes are set up this way, squeeze one brake lever and look to see which brake, front or rear, engages. Now do the same with the other brake lever.

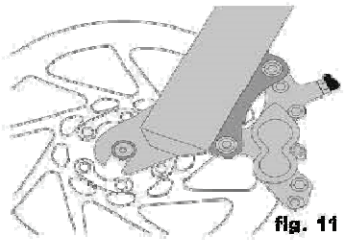


fig. 11

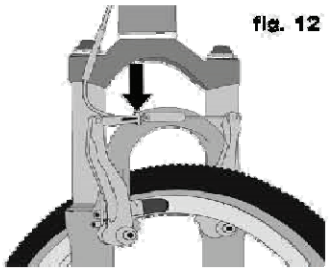


fig. 12

Make sure that your hands can reach and squeeze the brake levers comfortably. If your hands are too small to operate the levers comfortably, consult a certified bike mechanic before riding the bike. The lever reach may be adjustable; or you may need a different brake lever design.

Most rim brakes have some form of quick-release mechanism to allow the brake pads to clear the tire when a wheel is removed or reinstalled. When the brake quick-release is in the OPEN position, the brakes are inoperative. Ask a certified bike mechanic to make sure that you understand the way the brake quick-release works on your bike (see fig. 12-15) and check each time to make sure both brakes work correctly before you get on the bike.

B. **How Brakes Work**

The braking action of a bicycle is a function of the friction between the braking surfaces.

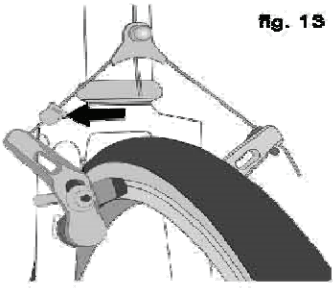


fig. 13

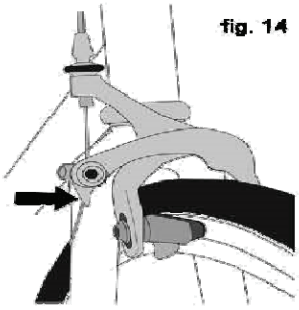


fig. 14

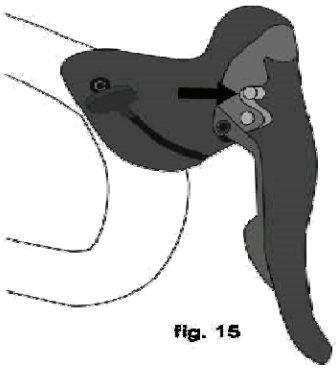


fig. 15

To make sure that you have maximum friction available, keep your wheel rims and brake pads or the disc rotor and caliper clean and free of dirt, lubricants, waxes or polishes.

Brakes are designed to control your speed, not just stop the bike. Maximum braking force for each wheel occurs at the point just before the wheel "locks up" (stops rotating) and starts to skid. Once the tire skids, you actually lose most of your stopping force and all directional control. You need to practice slowing and stopping smoothly without locking up a wheel. The technique is called progressive brake modulation. Instead of jerking the brake lever to the position where you think you'll generate appropriate braking force, squeeze the lever, progressively increasing the braking force. If you feel the wheel to begin to lock up, release pressure just a little to keep the wheel rotating just short of lock up. Its important to develop a feel for the amount of brake lever pressure required for each wheel at different speeds and on different surfaces. To better understand this, experiment a little by walking your bike and applying different amounts of pressure to each brake lever, until the wheel locks.

When you apply one or both brakes, the bike begins to slow, but your body wants to continue at the speed at which it was going. This causes a transfer of weight to the front wheel (or, under heavy braking, around the front wheel hub, which could send you flying over the handlebars).

A wheel with more weight on it will accept greater brake pressure before lockup; a wheel with less weight will lock up with less brake pressure. So, as you apply brakes and your weight is transferred forward, you need to shift your body toward the rear of the bike, to transfer weight back on the rear wheel; and at the same time, you need to both decrease rear braking and increase front braking force. This is even more important on descents, because descents shift weight forward.

Two keys to effective speed control and safe stopping are controlling wheel lockup and weight transfer. This weight transfer is even more pronounced if your bike has a front suspension fork. Front suspension "dips" under braking, increasing the weight transfer. Practice braking and weight transfer techniques where there is no traffic or other hazards and distractions.

Everything changes when you ride on loose surfaces or in wet weather. It will take longer to stop on loose surfaces or in wet weather. Tire adhesion is reduced, so the wheels have less cornering and braking traction and can lock up with less brake force. Moisture or dirt on the brake pads reduces their ability to grip. The way to maintain control on loose or wet surfaces is to go more slowly.

D. Shifting Gears

Your multi-speed bicycle will have a derailleur drivetrain (see 1. below), an internal gear hub drivetrain (see 2. below) or, in some special cases, a combination of the two.

1. How a Derailleur Drivetrain Works

If your bicycle has a derailleur drivetrain, the gear-changing mechanism will have:

- ◊ A rear cassette or freewheel sprocket cluster
- ◊ A rear derailleur
- ◊ Usually a front derailleur
- ◊ One or two shifters
- ◊ One, two or three sprockets called chainrings
- ◊ A drivetrain

a. Shifting Gears

There are several different types of shifting controls: levers, twist grips, triggers, combination shift/brake controls and push-buttons. Ask a certified bike mechanic to explain the type of shifting controls that are on your bike, and to show you how they work.

The vocabulary of shifting can be pretty confusing. A downshift is a shift to a "lower" or "slower" gear, one which is easier to pedal. An upshift is a shift to a "higher" or "faster", harder to pedal gear. What's confusing is that what's happening at the front derailleur is the opposite of what's happening at the rear derailleur (for details, read the instructions on Shifting the Rear Derailleur and Shifting the Front Derailleur). For example, you can select a gear which will make pedaling easier on a hill (make a downshift) in one of two ways: shift the chain down the gear "steps" to a smaller gear cluster, what is called a downshift looks like an upshift. The way to keep things straight is to remember that shifting the chain in towards the centerline of the bike is for accelerating and climbing and is called a downshift. Moving the chain out or away from the centerline of the bike is for speed and is called an upshift.

Whether upshifting or downshifting, the bicycle derailleur system design requires that the drive chain be moving forward and be under at least some tension. A derailleur will shift only if you are pedaling forward.

CAUTION: Never move the shifter while pedaling backward, nor pedal backwards immediately after having moved the shifter. This could jam the chain and cause serious damage to the bicycle.

b. Shifting the Rear Derailleur

The rear derailleur is controlled by the right shifter.

The function of the rear derailleur is to move the drive chain from one gear sprocket to another. The smaller sprockets on the gear cluster produce higher gear ratios. Pedaling in the higher gears requires greater pedaling effort, but takes you a greater distance with each revolution of the pedal cranks. The larger sprockets produce lower gear ratios. Using them requires less pedaling effort, but takes you a shorter distance with each pedal crank revolution. Moving the chain from a smaller sprocket of the gear cluster to a larger sprocket results in a downshift. Moving the chain from a larger sprocket to a smaller sprocket results in an upshift. In order for the derailleur to move the chain from one sprocket to another, the rider must be pedaling forward.

c. Shifting the Front Derailleur

The front derailleur, which is controlled by the left shifter, shifts the chain between the larger and smaller chainrings. Shifting the chain onto a smaller chainring makes pedaling easier (a downshift). Shifting to a larger chainring makes pedaling harder (an upshift).

d. **Which Gear Should I be in?**

The combination of larger rear and smaller front gears (fig. 16) is for the steepest hills. The smallest rear and largest front combination is for the greatest speed. It is not necessary to shift gears in sequence. Instead, find the "starting gear" which is right for your level of ability—a quick acceleration but easy enough to let you start from a stop without wobbling - and experiment with upshifting and downshifting to get a feel for the different gear

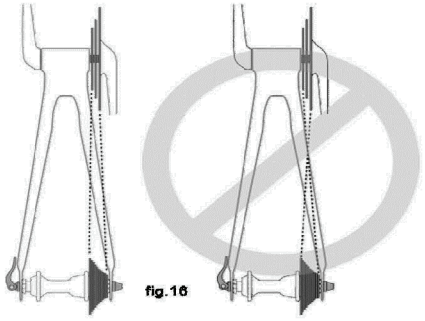


fig.16

WARNING: Never shift a derailleur onto the largest or smallest sprocket if the derailleur is not shifting smoothly. The derailleur may be out of adjustment and the chain could jam, causing you to lose control and fall.

combinations. At first, practice shifting where there are no obstacles, hazards or other traffic, until you've built up your confidence. Learn to anticipate the need to shift, and shift to a lower gear *before* the hill gets too steep. If you have difficulties with shifting, the problem could be mechanical adjustment. See a certified bike mechanic for help.

e. **What If It Won't Shift Gears?**

If moving the shift control one click repeatedly fails to result in a smooth shift to the next gear, chances are that the mechanism is out of adjustment. Take your bike to a certified bike mechanic to have it adjusted.

2. **How an internal Gear Hub Drivetrain Works**

If your bicycle has an internal gear hub drivetrain, the gear changing mechanism will consist of:

- ◊ A 3, 5, 7, 8, 12 speed or possibly an infinitely variable internal hub
- ◊ One, or sometimes two shifters
- ◊ One or two control cables
- ◊ One front sprocket called a chainring
- ◊ A drivetrain

a. **Shifting Internal Gear Hubs**

Shifting with an internal gear hub drivetrain is simply a matter of moving the shifter to the indicated position for the desired gear ratio. After you have moved the shifter to the gear position of your choice, ease the pressure on the pedals for an instant to allow the hub to complete the shift.

b. **Which Gear Should I Be In?**

The numerically lowest gear (1) is for the steepest hills. The numerically largest gear is for the greatest speed.

Shifting from an easier, "slower" gear (like 1) to a harder, "faster" gear (like 2 or 3) is called an upshift. Shifting from a harder, "faster" gear to an easier, "slower" gear is called a downshift. It is necessary to shift gears in sequence. Instead, find the "starting gear" for the conditions—a gear which is hard enough for quick acceleration but easy enough to let you start from a stop without wobbling—and experiment with upshifting and downshifting to get a feel for the different gears. At first, practice shifting where there are

no obstacles, hazards or other traffic, until you've built up your confidence. Learn to anticipate the need to shift, and shift to a lower gear before the hill gets to steep. If you have difficulties with shifting, the problem could be mechanical adjustment. See a certified bike mechanic for help.

c. **What If It Wont Shift Gears?**

If moving the shift control one click repeatedly fails to result in a smooth shift to the next gear, chances are that the mechanism is out of adjustment. Take the bike to a certified bike mechanic to have it adjusted.

E. Pedals

1) Toe Overlap is when your toe can touch the front wheel when you turn the handlebars to steer while a pedal is in the forward most position. This is common on small-framed bicycles, and is avoided by keeping the inside pedal up and the outside pedal down when making sharp turns. On any bicycle, this technique will also prevent the inside pedal from striking the ground in a turn.

WARNING: Toe Overlap could cause you to lose control and fall. Ask a certified bike mechanic to help you determine if the combination of frame size, crank arm length, pedal design and shoes you will use results in pedal overlap. Whether you have overlap or not, you must keep the inside pedal up and the outside pedal down when making sharp turns.

2) Some bicycles come equipped with pedals that have sharp and potentially dangerous surfaces. These surfaces are designed to add safety by increasing grip between the rider's shoe and the pedal. If your bicycle has this type of high performance pedal, you must take extra care to avoid serious injury from the pedals' sharp surfaces. Based on your riding style or skill level, you may prefer a less aggressive pedal design, or chose to ride with shin pads. A certified bike mechanic can show you a number of options and make suitable recommendations.

3) Toeclips and straps are a means to keep feet correctly positioned and engaged with the pedals. The toeclip positions the ball of the foot over the pedal spindle, which gives maximum pedaling power. The toe strap, when tightened, keeps the foot engaged throughout the rotation cycle of the pedal. While toeclips and straps give some benefit with any kind of shoe, they work most effectively with cycling shoes designed for use with toeclips. A certified bike mechanic can explain how toeclips and straps work. Shoes with deep treaded soles or welts which might make it more difficult for you to insert or remove your foot should not be used with toeclips and straps.

WARNING: Getting into and out of pedals with toeclips and straps requires skill which can only be acquired with practice. Until it becomes a reflex reaction, the technique requires concentration which can distract your attention and cause you to lose control and fall. Practice the use of toeclips and straps where there are no obstacles, hazards or traffic. Keep the straps loose, and don't tighten them until your technique and confidence in getting in and out of the pedals warrants it. Never ride in traffic with your toe straps tight.

4) Clipless pedals (sometimes called "step-in pedals") are another means to keep feet securely in the correct position for maximum pedaling efficiency. They have a plate, called a "cleat", on the sole of the shoe, which clicks into a mating spring-loaded fixture on the pedal. They only engage or disengage with a very specific motion which must be practiced until it becomes instinctive. Clipless pedals require shoes and cleats which are compatible with the make and model pedal being used.

Many clipless pedals are designed to allow the rider to adjust the amount of force needed to engage or disengage the foot. Follow the pedal manufacturer's instructions, or ask a certified bike mechanic to show you how to make this adjustment. Use the easiest setting until engaging and disengaging becomes a reflex action, but always make sure that there is sufficient tension to prevent unintended release of your foot from the pedal.

WARNING: Clipless pedals are intended for use with shoes specifically made to fit them and are designed to firmly keep the foot engaged with the pedal. Do not use shoes which do not engage the pedals correctly.

Practice is required to learn to engage and disengage the foot safely. Until engaging and disengaging the foot becomes a reflex action, the technique requires concentration which can distract your attention and cause you to lose control and fall. Practice engaging and disengaging clipless pedals in a place where there are no obstacles, hazards or traffic; and be sure to follow the pedal manufacturer's setup and service instructions. If you do not have the manufacturer's setup and service instructions, see a certified dealer or contact the manufacturer directly.

F. Bicycle Suspension

Many bicycles are equipped with suspension systems. There are many different types of suspension systems—too many to deal with individually in this manual. If your bicycle has a suspension system of any kind, be sure to read and follow the suspension manufacturer's setup and service instructions. If you do not have the manufacturer's setup and service instructions, see a certified dealer or contact the manufacturer directly.

WARNING: Failure to maintain, check and properly adjust the suspension system may result in suspension malfunction, which may cause you to lose control and fall.

If your bike has suspension, the increased speed you may develop also increases your risk of injury. For example, when braking, the front of a suspended bike dips. You could lose control and fall if you do not have experience with this system. Learn to handle your suspension system safely.

WARNING: changing suspension adjustment can change the handling and braking characteristics of your bicycle. Never change suspension adjustment unless you are thoroughly familiar with the suspension system manufacturer's instructions and recommendations, and always check for changes in the handling and braking characteristics of the bicycle after a suspension adjustment by taking a careful test ride in a hazard-free area.

Suspension can increase control and comfort by allowing the wheels to better

follow the terrain. This enhanced capability may allow you to ride faster; but you must not confuse the enhanced capabilities of the bicycle with your own capabilities as a rider. Increasing your skill will take time and practice. Proceed carefully until you have learned to handle the full capabilities of your bike.

WARNING: Not all bicycles can be safely retrofitted with some types of suspension systems. Before retrofitting a bicycle with any suspension, check with the bicycle's manufacturer to make sure that what you want to do is compatible with the bicycle's design. Failing to do so can result in catastrophic frame failure.

G. Tires and Tubes

Tires

Bicycle tires are available in many designs and specifications, ranging from general-purpose designs to tires designed to perform best under very specific weather or terrain conditions. If, once you've gained experience with your new bike, you feel that a different tire might better suit your riding needs, a certified bike mechanic can help you select the most appropriate design.

The size, pressure rating, and on some high performance tires the specific recommended use, are marked on the sidewall of the tires (see fig. 17). The part of this information which is most important to you Tire Pressure.

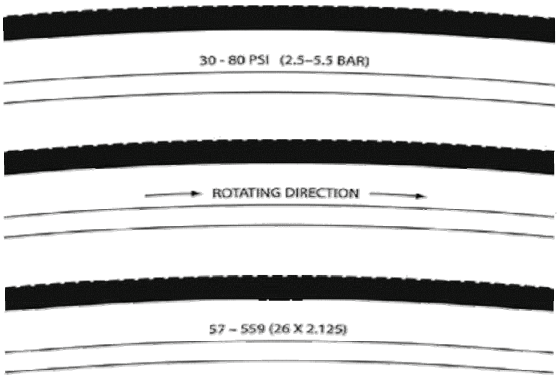


fig. 17

WARNING: Never inflate a tire beyond the maximum pressure marked on the tire's sidewall. Exceeding the recommended maximum pressure may blow the tire off the rim, which could cause damage to the bike and injury to the rider and bystanders.

The best and safest way to inflate a bicycle tire to the correct pressure is with a bicycle pump which has a built-in pressure gauge.

WARNING: There is a safety risk in using gas station air hoses or other air compressors. They are not made for bicycle tires. They move a large volume of air very rapidly, and will raise the pressure in your tire very rapidly, which could cause the tube to explode.

Tire pressure is given either as maximum pressure or as a pressure range. How a tire performs under different terrain or weather conditions depends largely on tire pressure. Inflating the tire to near its maximum recommended pressure gives the lowest rolling resistance; but also produces the harshest ride. High pressures work best on smooth, dry pavement.

Very low pressures, at the bottom of the recommended pressure range, give the best performance on smooth, slick terrain such as hard-packed clay, and on deep, loose surfaces such as deep, dry sand.

Tech *cont'd*

Tire pressure that is too low for your weight and the riding conditions can cause a puncture of the tube by allowing the tire to deform sufficiently to pinch the inner tube between the rim and the riding surface.

CAUTION: Pencil type automotive tire gauges can be inaccurate and should not be relied upon for consistent, accurate pressure readings. Instead, use a high quality dial gauge.

Ask a certified bike mechanic to recommend the best tire pressure for the kind of riding you will most often do, and have them inflate your tires to that pressure. Then, check inflation. So you'll know how correctly inflated tires should look and feel when you don't have access to a gauge. Some tires may need to be brought up to pressure every week or two, so it is important to check your tire pressures before every ride.

Some special high performance tires have unidirectional treads: their tread pattern is designed to work better in one direction than in the other. The sidewall marking of a unidirectional tire will have an arrow showing the correct rotation direction. If your bike has unidirectional tires, be sure that they are mounted to rotate in the correct direction.

Tire Valves

There are primarily two kinds of bicycle valves: the Schraeder valve and the Presta valve. The bicycle pump you use must have the fitting appropriate to the valve stems on your bicycle.

The Schraeder valve (fig. 18a) is like the valve on a car tire. To inflate a Schraeder valve tube, remove the valve cap and clamp the pump fitting onto the end of the valve stem. To let air out of a Schraeder valve, depress the pin in the end of the valve stem with the end of a key or other appropriate object.

Fig. 18a

The Presta valve (fig. 18b) has a narrower diameter and is only found on bicycle tires. To inflate a Presta valve tube using a Presta headed bicycle pump, remove the valve cap; unscrew (counterclockwise) the valve stem locknut; and push down on the valve stem to free it up. Then push the pump head on the valve head, and inflate. To inflate a Presta valve with a Schraeder pump fitting, you'll need a Presta adapter (available through KETTLER Parts & Service — 866-804-0440/parts@kettlerusa.com or at your local bike shop) which screws on to the valve stem once you've freed up the valve. The adapter fits into the Schraeder pump fitting. Close the valve after inflation. To let air out of a Presta valve, open up the valve stem lock nut and depress the valve stem.

Fig. 18b

Another valve that is used on bicycles, especially in Germany, is the Dunlop (fig. 18c) valve. It has a wider base than a Presta valve, similar enough in size to a Schrader valve to use identically drilled valve holes in rims, but it can be inflated with a Presta valve adapter. The inner mechanism of the valve can be replaced easily, without the need for special tools.

Fig.

WARNING: It is highly recommended that you carry a spare inner tube when you ride your bike. Patching a tube is an emergency repair. If you do not apply the patch correctly or apply several patches, the tube can fail, resulting in possible tube failure, which could cause you to loose control and fall. Replace a patched tube as soon as possible.

Service

WARNING: Technological advances have made bicycles and bicycle components more complex, and the pace of innovation is increasing. It is impossible for this manual to provide all the information required to properly repair and/or maintain your bicycle. In order to help minimize the chances of an accident and possible injury, it is critical that you have any repair or maintenance which is not specifically described in this manual performed by a certified bike mechanic. Equally important is that your individual maintenance requirements will be determined by everything from your riding style to geographic location. Consult a certified bike mechanic for help in determining your maintenance requirements.

WARNING: Many bicycle service and repair tasks require special knowledge and tools. Do not begin any adjustments or service on your bicycle until you have learned how to properly complete them. Improper adjustment or service may result in damage to the bicycle or an accident which can cause serious injury or death.

To take your bike to a certified bike mechanic for a checkup. Bike mechanics typically suggest you bring the bike in for a 30 day checkup. Another way to judge when its time for the first check-up is to bring the bike in after three to five hours of hard off-road use, or about ten to fifteen hours of on-road or more casual off-road use. But if you think something is wrong with the bike, take it to a certified bike mechanic before riding it again.

If you want to learn to do major service and repair work on your bike:

1. Contact the KETTLER Parts & Service Department for copies of the manufacturer's installation and service instructions for the components on your bike, or contact the component manufacturer directly
2. Ask the KETTLER Parts & Service Department or your local bike dealer to recommend a book on bicycle repair.
3. Ask your local bike dealer about the availability of bicycle repair courses in your area.

We recommend that you ask a certified bike mechanic to check the quality of your work the first time you work on something and before you ride the bike, just to make sure that you did everything correctly. Note - that anytime that you ask for a certified bike mechanic for help, advise or recommendations that this will require the time of the bike mechanic, and therefore may be a modest fee for the service.

We also recommend that you ask the KETTLER Parts & Service Department or your local bike dealer for guidance on what spare parts, such as inner tubes, light bulbs, etc. it would be appropriate for you to have once you have learned how to replace such parts when they require replacement.

A. Service Intervals

Some service and maintenance can and should be performed by the owner, and require no special tools or knowledge beyond what is presented in this manual

The following are examples of the type of service you should perform yourself. All other service, maintenance and repair should be performed in a properly equipped facility by a certified bike mechanic using the correct tools and procedures specified by the manufacturer.

Service *cont'd*

1) **Break-in Period:** Your bike will last longer and work better if you break it in before riding it hard. Control cables and wheel spokes may stretch or "seat" when a new bike is first used and may require readjustment by a certified bike mechanic. Your Mechanical Safety Check will help you identify some things that need readjustment. But even if everything seems fine to you, its best to take your bike to a local accredited bike dealer for a checkup. Dealers typically suggest you bring the bike in for a 30 day checkup. Another way to judge when its time for the first checkup is to bring the bike in after three to five hours of hard off-road use, or about ten to fifteen hours of on-road or more casual off-road use. But if you think something is wrong with the bike, take it to a certified bike mechanic before riding it again.
2) **Before every ride:** Mechanical Safety Check.
3) **After every long or hard ride; if the bike has been exposed to water or grit; or at least every 100 miles:** Clean the bike and lightly lubricate the chains rollers with a good quality bicycle chain lubricant. Wipe off excess lubricant with a lint-free cloth. Lubrication is a function of climate. Talk to a local dealer about the best lubricants and the recommended lubrication frequency for your area.
4) **After every long or hard ride or after every 10 to 20 hours of riding:**
    - ◊ Squeeze the front brake and rock the bike forward and back. Everything feel solid? If you feel a clunk with each forward or backward movement of the bike, you probably have a loose headset and should check it.
    - ◊ Lift the front wheel off the ground and swing it from side to side. Feel smooth? If you feel it binding or roughness in the steering, you may have a tight headset and should check it.
    - ◊ Grab one pedal and rock it toward and away from the centerline of the bike; then do the same with the other pedal. Anything feel loose? If so, your pedals may have to be tightened.
    - ◊ Take a look at the brake pads. Starting to look worn or not hitting the wheel rim squarely? It could be time to adjust or replace them.
    - ◊ Carefully check the control cables and cable housings. Any rust? Kinks? Fraying? If so, it is time to replace them.
    - ◊ Squeeze each adjoining pair of spokes on either side of each wheel between your thumb and index finger. Do they feel about the same? If any feel loose, have a certified bike mechanic check the wheel for tension and trueness.
    - ◊ Check the tires for excess wear, cuts or bruises. Replace them if necessary.
    - ◊ Check the wheel rims for excess wear, dings, dents and scratches. Consult a certified bike mechanic if you see any rim damage.
    - ◊ Check to make sure that all parts and accessories are still secure, and tighten any which are not.
    - ◊ Check the frame, particularly in the area around all tube joints; the handlebars; the stem; and the seatpost for any deep scratches, cracks or discoloration. These are signs of stress-caused fatigue and indicate that a part is at the end of its useful life and needs to be replaced.

Service *cont'd*

WARNING: Like any mechanical device, a bicycle and its components are subject to wear and stress. Different materials and mechanisms wear or fatigue from stress at different rates and have different life cycles. If a component's life cycle is exceeded, the component can suddenly and catastrophically fail, causing serious injury or death to the rider. Scratches, cracks, fraying and discoloration are signs of stress-caused fatigue and indicate that a part is at the end of its useful life and needs to be replaced. While the materials and workmanship of your bicycle or of individual components may be covered by a warranty for a specified period of time by the manufacturer, this is no guarantee that the product will last the term of the warranty. Product life is often related to the kind riding you do and to the treatment to which you submit the bicycle. The bicycle's warranty is not meant to suggest that the bicycle cannot be broken or will last forever. It only means that the bicycle is covered subject to the terms of the warranty. Please be sure to read the Intended Use Of Your Bicycle and The Lifespan Of Your Bike and Its Components.

5) **As Required:** If either brake lever fails the Mechanical Safety Check, don't ride the bike and have a certified bike mechanic check the brakes. If the chain wont shift smoothly and quietly from gear to gear, the derailleur is out of adjustment and should be checked out.
6) **Every 25 (hard off-road) to 50 (on-road) hours of riding:** Take your bike to a certified bike mechanic for a complete checkup.

B. If Your Bike Sustains An Impact:

First, check yourself for injuries, and take care of them as best you can. Seek medical attention if necessary.

Next, check your bike for damage.

After any crash, take your bike to a certified bike mechanic for a thorough check. Carbon composite components, including frames, wheels, handlebars, stems, cranksets, brakes, etc. which have sustained an impact must not be ridden until they have been disassembled and thoroughly inspected by a qualified bike mechanic.

WARNING: A crash or other impact can put extraordinary stress on bicycle components, causing them to fatigue prematurely. Components suffering from stress fatigue can fail suddenly and catastrophically, causing loss of control, serious injury or death.

Intended Use of Your Bicycle

WARNING: Understand your bike and its intended use. Choosing the wrong bicycle for your purpose can be hazardous. Using your bike the wrong way is dangerous.

No one type of bicycle is suited for all purposes. There are many types of bicycles and many variations within each type. There are many types of mountain, road, racing, hybrid, touring, cyclocross, tandem and folding bicycles.

There are also bicycles that mix features. For example, there are road/racing bikes with triple cranks. These bikes have the low gearing of a touring bike, the quick handling of a racing bike, but are not well suited for carrying heavy loads on a tour. For that purpose you want a touring bike.

Within each type of bicycle, one can optimize for certain purposes. Visit you local bicycle shop and find someone with expertise in the area that interests you. Do your homework. Seemingly small changes such as the choice of tires can improve or diminish the performance of a bicycle for certain purposes.

The following pages will outline the intended uses of various types of bikes.

Industry usage conditions are generalized and evolving. Consult your local dealer about how you intend to use your bike.

High-Performance Road

Condition 1

Bikes designed for riding on a paved surface where the tires do not lose ground contact.

Intended To be ridden on paved roads only.

Not Intended For off-road, cyclocross, or touring with racks or panniers.

Trade Off Material use is optimized to deliver both light weight and specific performance. You must understand that 1) these types of bikes are intended to give an aggressive racer or competitive cyclist a performance advantage over a relatively short product life, 2) a less aggressive rider will enjoy longer frame life, 3) you are choosing light weight (shorter frame life) over more frame weight and longer frame life, 4) you are choosing light weight over more dent resistant or rugged frames that weigh more. All frames that are very light need frequent inspection. These frames are likely to be damaged or broken in a crash. They are not designed to take abuse or be a rugged workhorse.

MAXIMUM WEIGHT LIMIT

Rider	Luggage*	Total
Lbs./kg	Lbs./kg	Lbs./kg
275/125	10/4.5	285/129

* Seat Bag / Handlebar Bag Only

Intended Use of Your Bicycle *cont'd*

General Purpose Riding

Condition 2

Bikes designed for riding Condition 1, plus smooth gravel roads and improved trails with moderate grades where the tires do not lose ground contact

Intended For paved roads, gravel or dirt roads that are in good condition, and bike paths

Not Intended For off-road or mountain bike use, or for any kind of jumping. Some of these bikes have suspension features, but these features are designed to add comfort, not off-road capability. Some come with relatively wide tires that are well suited to gravel or dirt paths. Some come with relatively narrow tires that are best suited to faster riding on pavement. If you ride on gravel or dirt paths, carry heavier loads or want more tire durability talk to your dealer about wider tires.

MAXIMUM WEIGHT LIMIT

Rider	Luggage	Total
Lbs./kg	Lbs./kg	Lbs./kg
285/136	30/14	285/129
For Touring or Trekking		
300/136	55/25	355/161

Cross-Country, Marathon, Hardtails

Condition 3

Bikes designed for riding conditions 1 & 2, plus rough trails, small obstacles, and smooth technical areas, including areas where momentary loss of tire contact with the ground may occur. NOT jumping. All mountain bikes without rear suspension are condition 3, and so are some lightweight rear suspension models.

Intended For cross-country riding and racing which ranges from mild to aggressive over intermediate terrain (i.e. hilly with small obstacles like roots, rocks, loose surfaces and hard pack and depressions). Cross-country and marathon equipment (tires, shocks, frames, drive trains) are light-weight, favoring nimble speed over brute force. Suspension travel is relatively short since the bike is intended to move quickly on the ground.

Not Intended For hardcore freeriding, extreme downhill, dirt jumping, slope style, or very aggressive or extreme riding. No spending time in the air landing hard and hammering through obstacles.

Trade Off Cross-country bikes are lighter, faster to ride uphill, and more nimble than all-mountain bikes. Cross-country and marathon bikes trade off some ruggedness for pedaling efficiency and uphill speed.

Intended Use of Your Bicycle *cont'd*

MAXIMUM WEIGHT LIMIT

Rider	Luggage*	Total
Lbs./kg	Lbs./kg	Lbs./kg
300/136	5/2.3	305/138
* Seat Bag Only		
Front suspension frames manufactured with original equipment seat stay and dropout rack mounts only		
300/136	55/25	355/161

All Mountain

Condition 4

Bikes designed for riding conditions 1, 2 & 3, plus rough technical areas, moderately sized obstacles, and small jumps.

Intended For trail and uphill riding. All-Mountain bicycles are: 1) more heavy duty than cross-country bikes, but less heavy duty than Freeride bikes, 2) lighter and more nimble than Freeride bikes, 3) heavier and have more suspension travel than a cross-country bike, allowing them to be ridden in more difficult terrain, over larger obstacles and moderate jumps, 4) intermediate in suspension travel and use components that fit the intermediate intended use, 5) cover a fairly wide range of intended use, and within this range are models that are more or less heavy duty.

Not Intended For use in extreme forms of jumping/riding such as hardcore mountain, freeriding, downhill, North Shore, dirt jumping, Hucking, etc. No large drop offs, jumps or launches (wooden structures, dirt embankments) requiring long suspension travel or heavy duty components; and no spending time in the air landing hard and hammering through obstacles.

Trade Off All-Mountain bikes are more rugged than cross-country bikes, for riding more difficult terrain. All-Mountain bikes are heavier and harder to ride uphill than cross-country bikes. All-Mountain bikes are lighter, more nimble and easier to ride uphill than Freeride bikes. All-Mountain bikes are not as rugged as Freeride bikes and must not be used for more extreme riding and terrain.

MAXIMUM WEIGHT LIMIT

Rider	Luggage*	Total
Lbs./kg	Lbs./kg	Lbs./kg
300/136	5/2.3	305/138
* Seat Bag Only		

The Lifespan of Your Bicycle & Its Components

1. Nothing Lasts Forever, Including Your Bike

When the useful life of your bike or its components is over, continued use is hazardous.

Every bicycle and its component parts have a finite, limited useful life. The length of that life will vary with the construction and materials used in the frame and components; the maintenance and care the frame and components receive over the life; and the type and amount of use to which the frame and components are subjected. Use in competitive events, trick riding, ramp riding, jumping, aggressive riding, riding on severe terrain, riding in severe climates, riding with heavy loads, commercial activities and other types of non-standard use can dramatically shorten the life of the frame and components. Any one or a combination of these conditions may result in an unpredictable failure.

WARNING: Many bicycle service and repair tasks require special knowledge and tools. Do not begin any adjustments or service on your bicycle until you have learned how to properly complete them. Improper adjustment or service may result in damage to the bicycle or an accident which can cause serious injury or death.

All aspects of use being identical, lightweight bicycles and their components will usually have a shorter life than heavier bicycles and their components. In selecting a lightweight bicycle or components you are making a tradeoff, favoring the higher performance that comes with lighter weight over longevity. So, if you choose lightweight, high performance equipment, be sure to have it inspected frequently.

You should have your bicycle and its components checked periodically by a certified bike mechanic for indicators of stress and/or potential failure, including cracks, deformation, corrosion, paint peeling, dents and other indicators of potential problems, inappropriate use or abuse. These are important safety checks and very important to help prevent accidents, bodily injury to the rider and shortened product life.

2. Perspective

Today's high performance bicycles require frequent and careful inspection and service. In this section we try to explain some underlying material science basics and how they relate to your bicycle. We discuss some of the trade-offs made in designing your bicycle and what you can expect from your bicycle; and we provide important, basic guidelines on how to maintain and inspect it. We cannot teach you everything you need to know to properly inspect and service your bicycle; and that is why we repeatedly urge you to take your bicycle to a certified bike mechanic for professional care and attention.

WARNING: Frequent inspection of your bike is important to your safety. Follow the Mechanical Safety Check in this manual before every ride.

Periodic, more detailed inspection of your bicycle is important. How often this more detailed inspection is needed depends on you.

You, the rider/owner, have control and knowledge of how often you use your bike, how hard you use it and where you use it. Because your dealer cannot track your use, you must take responsibility for periodically bringing your bike to a certified bike mechanic for inspection and service. A certified bike mechanic can help you decide what frequency of

The Lifespan of Your Bicycle & Its Components *cont'd*

inspection and service is appropriate for how and where you use your bike.

For your safety and understanding, we urge you to read this section in its entirety. The materials used to make your bike determine how frequently to inspect.

Ignoring this WARNING can lead to frame, fork or other component failure, which can result in serious injury or death.

A. Understanding Metals

Steel is the traditional material for building bicycle frames. It has good characteristics, but is high performance bicycles, steel has been largely replaced by aluminum and some titanium. The main factor driving this change is interest by cycling enthusiasts in lighter bicycles.

Properties of Metals

Please understand that there is no simple statement that can be made that characterizes the use of different metals for bicycles. What is true is how the metal is chosen is applied is much more important than the material alone. One must look at the way the bike is designed, tested, manufactured, supported along with the characteristics of the metal rather than seeking a simplistic answer.

Metals vary widely in their resistance to corrosion. Steel must be protected or rust will attack it. Aluminum and titanium quickly develop an oxide film that protects the metal from further corrosion. Both are therefore quite resistant to corrosion. Aluminum is not perfectly corrosion resistant, and particular care must be used where it contacts other metals and galvanic corrosion can occur.

Metals are comparatively ductile. Ductile means bending, buckling and stretching before breaking. Generally speaking,, of the common bicycle frame building materials steel is the most ductile, titanium less ductile, followed by aluminum.

Metals vary in density. Density is weight per unit of material. Steel weighs 7.8 grams/ cm^3 (grams per cubic centimeter), titanium 4.5 grams/cm^3, aluminum 2.75 grams/cm^3. Contrast these numbers with carbon fiber composite at 1.45 grams/cm^3.

Metals are subject to fatigue. With enough cycles of use, at high enough loads, metals will eventually develop cracks that lead to failure. It is important that you read The Basics Of Metal Fatigue section of this manual.

Lets say you hit a curb, ditch, rock, car, another cyclist or other object. At any speed above a fast walk, your body will continue to move forward, momentum carrying you over the front of the bike. You cannot and will not stay on the bike, and what happens to the frame, fork and other components is irrelevant to what happens to your body.

What should you expect from your metal frame? It depends on many complex factors, which is why we tell you that crashworthiness cannot be a design criteria. With that important note, we can tell you that if the impact is hard enough the fork or frame may be bent or buckled. On a steel bike, the steel fork may be severely bent and the frame undamaged. Aluminum is less ductile than steel, but you can expect the fork and frame to be bent or buckled. Hit harder and the top tube may be broken in tension and the down tube buckled. Hit harder and the top tube may be broken, the down tube buckled and broken, leaving the head tube and fork separated from the main triangle.

When a metal bike crashes, you will usually see some evidence of this ductility in bent, buckled or folded metal.

The Lifespan of Your Bicycle & its Components *cont'd*

It is now common for the main frame to be made of metal and the fork of carbon fiber. The relative ductility of metals and the lack of ductility of carbon fiber means that in a crash scenario you can expect some bending or buckling in the metal but none in the carbon fiber. Below some load the carbon fork may be intact even though the frame is damaged. Above some load the carbon fork will be completely broken.

The Basics Of Metal Fatigue

Common sense tells us that nothing that is used lasts forever. The more you use something, and the harder you use it, and the worse the conditions you use it in, the shorter its lifespan.

Fatigue is the term used to describe accumulated damage to a part caused by repeated loading. To cause fatigue damage, the load the part receives must be great enough. A crude, often-used example is bending a paperclip back and forth (repeated loading) until it breaks. This simple definition will help you understand that fatigue has nothing to do with time or age. A bicycle in a garage does not fatigue. Fatigue happens only through use.

So what kind of "damage" are we talking about? On a microscopic level, a crack forms in a highly stressed area. As the load is repeatedly applied, the crack grows. At some point the crack becomes visible to the naked eye. Eventually it becomes so large that the part is too weak to carry the load that it could carry without the crack. At that point there can be a complete and immediate failure of the part.

One can design a part that is strong that fatigue life is nearly infinite. This requires a lot of material and a lot of weight. Any structure that must be light and strong will have a finite fatigue life. Aircraft, race cars, motorcycles all have parts with finite fatigue lives. If you wanted a bicycle with an infinite fatigue life, it would weigh far more than any bicycle sold today. So we all make a trade-off: the wonderful, lightweight performance we want requires that we inspect the structure.

What To Look For

ONCE A CRACK STARTS IT CAN GROW AND GROW FAST. Think about the crack as forming a pathway to failure. This means that any crack is potentially dangerous and will only become more dangerous.	RULE OF THUMB #1: If you find a crack, replace the part.
CORROSION SPEEDS DAMAGE. Cracks grow more quickly when they are in a corrosive environment. Think about the corrosive solution as further weakening and extending the crack.	RULE OF THUMB #2: Clean your bike, lubricate your bike, protect your bike from salt, remove any salt as soon as you can.
STAINS AND DISCOLORATION CAN OCCUR NEAR A CRACK. Such staining may be a warning sign that a crack exists.	RULE OF THUMB #3: Inspect and investigate any staining to see if it is associated with a crack.

The Lifespan of Your Bicycle & its Components *cont'd*

SIGNIFICANT SCRATCHES, GOUGES, DENTS OR SCORING CREATE STARTING POINTS FOR CRACKS. Think about the cut surface as a focal point for stress (in fact, engineers call such areas :stress risers," areas where the stress is increased). Perhaps you have seen glass cut? Recall how the glass was scored and then broke on the score line.	RULE OF THUMB #4: Do not scratch, gouge or score any surface. If you do, pay frequent attention to this area or replace the part.
SOME CRACKS (particularly larger ones) MAY MAKE CREAKING NOISE AS YOU RIDE. Think about such a noise as serious warning signal. Note that a well maintained bicycle will be very quiet and free of creaks and squeaks.	RULE OF THUMB #5: Investigate and find the source of any noise. It may not be a crack, but whatever is causing the noise should be fixed promptly.

In most cases a fatigue cracks not a defect. It is a sign that the part has been worn out, a sign the part has reached the end of its useful life. When your car tires wear down to the point that the tread bars are contacting the road, those tires are not defective. Those tires are worn out and the tread bar says "time for replacement." when a metal part shows a fatigue crack, it is worn out. The crack says "time for replacement."

Fatigue Is Not A perfectly Predictable Science

Here are some general factors to help you determine how often your bicycle should be inspected. The more you fit the "shorten product life" profile, the more frequent your need to inspect. The more you fit the "lengthen product life" profile, the less frequent your need to inspect.

Factors that shorten product life:

- ◊ ***Hard, harsh riding style***
- ◊ ***"Hits", crashes, jumps, other "shots" to the bike***
- ◊ ***High mileage***
- ◊ ***Higher body weight***
- ◊ ***Stronger, more fit, more aggressive rider***
- ◊ ***Corrosive environment (wet, salt air, winter road salt, accumulated sweat)***
- ◊ ***Presence of abrasive mud, dirt, sand, soil in riding environment***

Factors that lengthen product life:

- ◊ ***Smooth, fluid riding style***
- ◊ ***No "hits", crashes, jumps, or other "shots" to the bike***
- ◊ ***Low mileage***
- ◊ ***Lower body weight***
- ◊ ***Less aggressive rider***
- ◊ ***Non-corrosive environment (dry, salt-free air)***
- ◊ ***Clean riding environment***

The Lifespan of Your Bicycle & its Components *cont'd*

WARNING: Do not ride a bicycle or component with any crack, bulge or dent, even a small one. Riding a cracked frame, fork or component could lead to complete failure, with risk of serious injury or death.

B. Understanding Composites

All riders must understand a fundamental reality of composites. Composite materials constructed of carbon fibers are strong and light, but when crashed or overloaded, carbon fibers do not bend, they break.

What Are Composites?

The term "composites" refers to the fact that a part or parts are made up of different components or materials. You've heard the term "carbon fiber bike". This really means "composite bike."

Carbon fiber composites are typically a strong, light fiber in a matrix of plastic, molded to form a shape. Carbon composites are light relative to metals. Steel weighs 7.8 grams/cm^3 (grams per cubic centimeter), titanium 4.5 grams/cm^3, aluminum 2.75 grams/cm^3. Contrast these numbers with carbon fiber composite at 1.45 grams/cm^3.

The composites with the best strength-to-weight ratios are made of carbon fiber in a matrix of epoxy plastic. The epoxy matrix bonds the carbon fibers together, transfers load to other fibers, and provides a smooth outer surface.

Why Are Composites Used?

Unlike metals, which have uniform properties in all directions (engineers call this isotropic), carbon fibers can be placed in specific orientations to optimize the structure for particular loads. The choice of where to place the carbon fibers gives engineers a powerful tool to create strong, light bicycles. Engineers may also orient fibers to suit other goals such as comfort and vibration damping.

Carbon fiber composites are very corrosion resistant, much more so than most metals. Think about carbon fiber or fiberglass boats. Carbon fiber materials have a very high strength-to-weight ratio.

What Are The Limits Of Composites?

Well designed "composite" or carbon fiber bicycles and components have long fatigue lives, usually better than their metal equivalents.

Wile fatigue life is an advantage of carbon fiber, you must still regularly inspect your carbon fiber frame, fork, or components.

Carbon fiber composites are not ductile. Once a carbon structure is overloaded, it will not bend; it will break. At and near the break, there will be rough, sharp edges and maybe delamination of carbon fiber or carbon fiber fabric layers. There will be no bending, buckling, or stretching.

If You Hit Something Or Have A Crash, What Can You Expect From Your Carbon Fiber Bike?

Lets say you hit a curb, ditch, rock, car, other cyclist or other object. At any speed above a

The Lifespan of Your Bicycle & its Components *cont'd*

fast walk, your body will continue to move forward, the momentum carrying you over the front of your bike. You cannot and will not stay on the bike and what happens to the frame, fork and other components is irrelevant to what happens to your body.

What should you expect from your carbon frame? It depends on many complex factors. But we can tell you that if the impact is hard enough, the fork or frame may be completely broken. Note the significant difference in behavior between carbon and metal. Even if the carbon frame was twice as strong as a metal frame, once the carbon frame is overloaded it will not bend, it will break. Completely.

Inspection Of Composite Frame, Fork and Components.

Cracks:

Inspect for cracks, broken, or splintered areas. Any crack is serious. Do not ride any bicycle or component that has a crack of any size.

Delamination:

Delamination is serious damage. Composites are made from layers of fabric. Delamination means that the layers of fabric are no longer bonded together. Do not ride any bicycle or component that has any delamination.

These are some delamination clues:

1. A cloudy or white area. This kind of area looks different from the ordinary undamaged areas. Undamaged areas will look glassy, shiny, or "deep", as if one was looking into a clear liquid. Delaminated areas will look opaque and cloudy.
2. Bulging or deformed shape. If delamination occurs, the surface shape may change. The surface may have a bump, a bulge, soft spot, or not be smooth and fair.
3. A difference in sound when tapping the surface. If you gently tap the surface of an undamaged composite you will hear a consistent sound, usually a hard, sharp sound. If you then tap a delaminated area, you will hear a different sound, usually duller, less sharp.

Unusual Noises:

Either a crack or delamination can cause creaking noises while riding. Think about such a noise as a serious warning signal. A well maintained bicycle will be quiet and free of creaks and squeaks. Investigate and find the source of any noise. It may not be a crack or delamination, but whatever is causing the noise must be fixed before riding.

WARNING: Do not ride a bicycle or component with any delamination or crack. Riding a delaminated or cracked frame, fork or component could lead to complete failure, with risk of serious injury or death.

C. Understanding Components

It is often necessary to remove and disassemble components in order to properly and carefully inspect them. This is a job for a certified bike mechanic with special the special tools, skills and experience to inspect and service today's high-tech high-performance bicycles and their components.

Aftermarket "Super Light" Components

Think carefully about your rider profile as outlined above. The more you fit the "shorten product life" profile, the more you must question the use of super light components. The more

The Lifespan of Your Bicycle & its Components *cont'd*

you fit the "lengthen product life" profile, the more likely it is that lighter components may be suitable for you. Take these choices seriously and understand that you are responsible for the changes.

A useful slogan to remember when contemplating changing components is "Strong, Light, Cheap — pick two".

Original Equipment Components

Bicycle and component manufacturers test the fatigue life of the components that are original equipment on your bike. This means that they have met test criteria and have reasonable fatigue life. It does not mean that the original components will last forever. They wont.

Appendix
Coaster Brakes

How The Coaster Brake Works

The coaster brake is a sealed mechanism which is a part of the bicycles rear wheel hub. The brake is activated by reversing the rotation of the pedal cranks (fig. 1). Start with the pedal cranks in a nearly horizontal position, with the front pedal in about the 4 o'clock position, and apply downward foot pressure on the pedal that is to the rear. About 1/8 turn rotation will activate the brake. The more downward pressure you apply, the more braking force, up to the point where the rear wheel stops rotating and begins to skid.

WARNING: Before riding, make sure that the brake is working properly. If it is not working properly, have the bicycle checked by a certified bike mechanic before you ride it.

WARNING: If your bike has only a coaster brake, ride conservatively. A single rear brake does not have the stopping power of a front-and-rear brake system.

Adjusting Your Coaster Brake

Coaster brake service and adjustment requires special tools and special knowledge. Do not attempt to disassemble or service your coaster brake. Take the bicycle to a certified bike mechanic for coaster brake service.

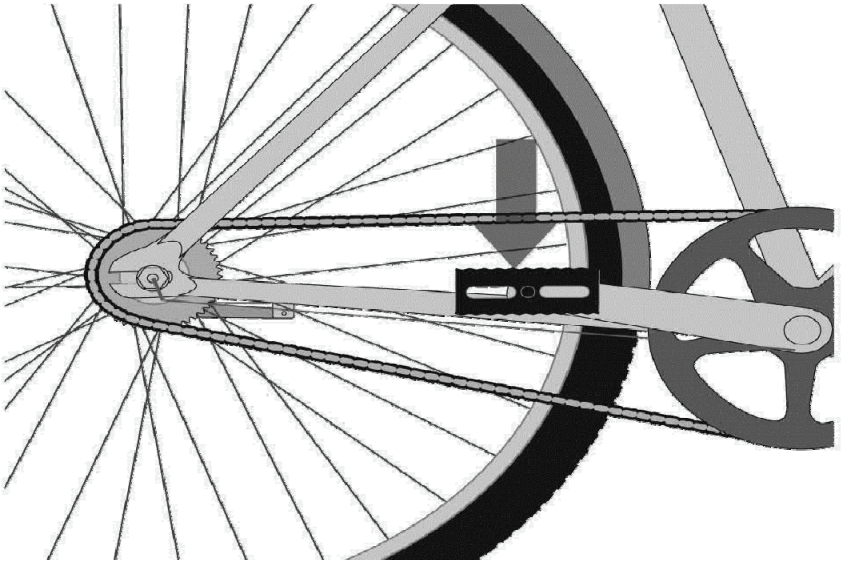


Fig. 1

Limited Warranty

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, MADE BY EITHER THE DISTRIBUTOR OR THE MANUFACTURER ON KETTLER PRODUCTS, EXCEPT THE MANUFACTURER'S LIMITED WARRANTY AGAINST DEFECTS IN MATERIAL SET OUT BELOW:

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Ordering Spare Parts

Ordering Spare Parts

Contact:

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Online: www.KETTLERusa.com
E-mail: info@KETTLERusa.com
For parts/service ONLY: call 866-804-0440 or e-mail parts@KETTLERusa.com

NOTE— This manual is only meant to act as a guide. KETTLER recommends that your bike

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